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The Outlook

Short-Range Jet Airliners?

NEVER before have technicians been so sharply at variance in their views concerning transport aircraft, and never were operators so bewildered by technical considerations. This confusion has arisen principally from the entry into the civil field of the gas turbine in its two basic forms (turbojet and turboprop). Problems involved are formidable enough when considered solely from the standpoint of design; but when operational factors are introduced the difficulties assume immense proportions. Clear thinking and breadth of vision were never more sorely needed, and this country is indeed fortunate in having produced men of the calibre of Air Commodore Sir Frank Whittle, whose views on short-range jet transports are set out in this issue, and Mr. Peter Masefield, to whose monumental paper "Some Economic Factors in Civil Aviation" Sir Frank acknowledges his indebtedness.

That designers and operators of short-range civil aircraft should arrive at some decision on the power plant issue becomes more urgent daily. The question was first brought into focus by the announcement a year ago that, having contemplated the Vickers Viscount with four turboprops as a replacement for the Viking, British European Airways had decided in favour of the Airspeed Ambassador, powered by two Bristol Centaurus piston engines. At the time of the decision—indeed, the situation has not since altered materially—Great Britain had wider and longer experience with turbines than America, or any other nation. The uneasiness which followed the announcement was to some extent allayed by the explanation that radio aids and air traffic control in B.E.A.'s sphere of operations had not developed as expected, and that the prospects were disappointing. Under such adverse conditions, aircraft were forced to operate for considerable periods at heights below 10,000 ft, and, in the absence of adequate control, an unduly large reserve of fuel was necessary to safeguard against long periods of "stacking." Thus, it was the question of fuel consumption which had chiefly influenced B.E.A.'s decision.

That an expert such as Sir Frank Whittle is now advocating the *pure* jet for short-haul transport work may seem astonishing; yet such have been the advances in the technique of air traffic control that the possibility already exists of profitably operating turbojet airliners on selected routes. To pages 153-156 of this issue the reader is commended for an insight into the potentialities of such aircraft. There is abundant evidence that Britain and Canada could lead—and indeed supply—the world in this important field. Two pure-jet research airliners—the Nene-Viking and the Tudor VIII—have been flying for some months, and the first flight of the A. V. Roe (Canada) C.102, with four Derwents, is fast approaching. More than one American operator is believed to be resigned to retaining his present piston-engined equipment until pure-jet replacements should be forthcoming. A golden opportunity is at the door.

Sweet Reasonableness

ALMOST complete absence of "politics" marked the debate on civil aviation in the House of Lords on February 2nd, a welcome sign that the Upper House realizes, if the Lower House does not, that the subject is far too important to be used for arguments on Party lines.

Lord Swinton, a former Secretary of State for Air and our first Minister of Civil Aviation, seemed to have adopted the mantle of Lord Londonderry during the latter's illness, and wanted to know how much civil aviation is really costing the taxpayer, not merely the losses incurred by the Corporations. He had made his own estimates which, on the whole, were fairly close to the actual figure given later by Lord Pakenham.

Both Lord Swinton and Lord Balfour tackled the Min-

ister about the charter companies, and it was scarcely surprising that Lord Pakenham quoted from the statement issued by the British Air Charter Association to prove that these companies are satisfied that they have, as he put it, "come pretty well out of these proposals." Last week we pointed out that we should have used less polite language.

Lord Swinton made what appears to us a rather surprising suggestion. He thought the time had come when the Ministry of Civil Aviation should be abolished and made a section of the Ministry of Transport. It may be agreed that, as Lord Swinton said, circumstances have changed greatly since the Ministry was formed in 1944, but we doubt if it would be wise to merge it now with another Ministry. Let us have economies in the Ministry of Civil Aviation headquarters, by all means, but as Lord Pakenham pointed out without attempting to express any opinion as to his own redundancy, it would be a mistake to imagine that any merger would greatly reduce the number of staff. Surely the outside staff needed for the various "aids," and for airports, etc., would need to be much the same whether headquarters were M.C.A. or M.O.T.

A Royal Charter

CONGRATULATIONS to the Royal Aeronautical Society on attaining the dignity of being granted a Royal Charter. By this act His Majesty the King has set the seal of approval upon the Society of which, in 1922, he became Patron while he was Duke of York, and of which he has remained the Patron ever since.

British aviation owes much to the present Royal Family. Not only is the King the Patron of the Royal Aeronautical Society, but Princess Elizabeth is Grand Master of the Guild of Air Pilots and Air Navigators, while last summer Her Majesty the Queen graced the Northern Heights Model Flying Club Gala with her presence, and gave a tremendous impetus to the model flying movement by offering a cup for competition. And, of course, His Majesty maintains the King's Flight with which members of the Royal Family have travelled extensively.

The R.Ae.S. has not reached its present status without a struggle. Formed in 1866 by a few men to advance the knowledge of aeronautics, at a time when many held flight by a heavier-than-air machine to be impossible, the Society kept the torch alight by lectures and meetings. By 1918 its contribution to the art and science of aeronautics earned for the Society the honour of being granted the Royal prefix, but financially it was not until 1939 that the foundation of an endowment fund made its future secure. To that fund the aircraft industry and many public-spirited individuals contributed a total of more than £100,000.

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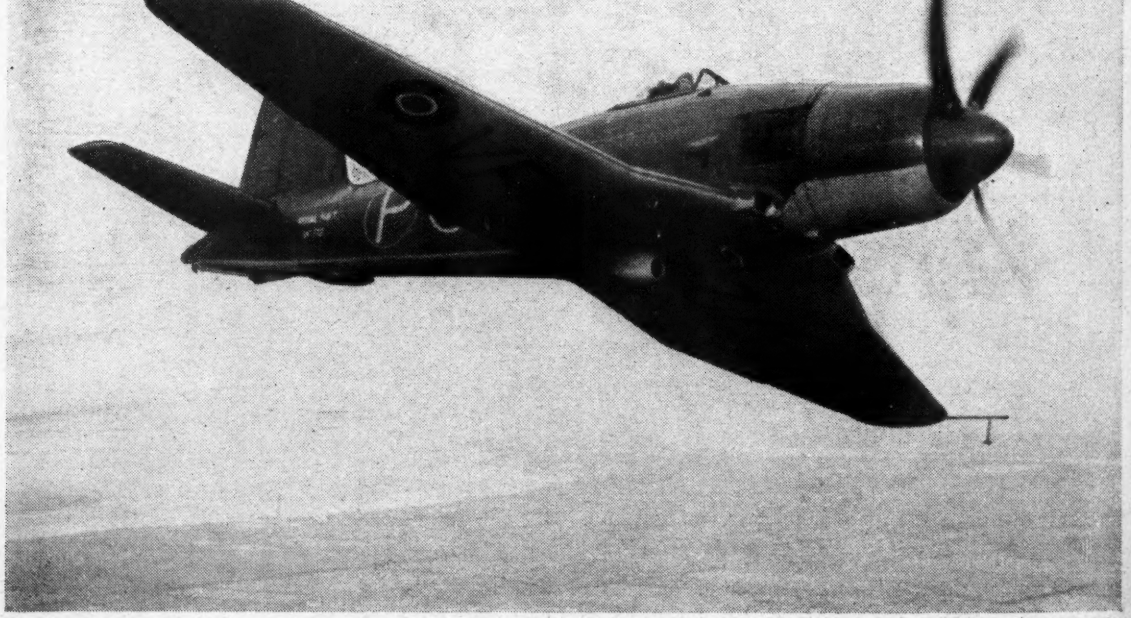


YORKSHIRE STUKA: The latest version of the Blackburn Y.A.1 (S.28/43) naval dive bomber and torpedo aircraft, which is characterized by reduced dihedral (3 deg.) and power-operated controls. For the testing of the controls the machine will shortly be delivered to Boscombe Down. The Bristol Centaurus 59 engine gives a top speed of 370 m.p.h. at 18,000 ft.

JET LINERS FOR SHORT RANGE

Analysis of Operating Economy

The Avro-Canada C-102 (Four R.-R. Derwent 5s)

A Paper read by A. Cdre. Sir Frank Whittle before the Aero Club de France

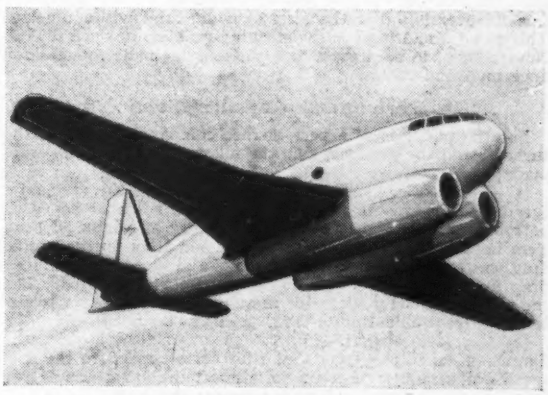
WITH the declared purpose of showing that the operation of jet aircraft between London and Paris is well worth while, Air Commodore Sir Frank Whittle, K.B.E., C.B., R.A.F. (Retd.), lectured before the Aero Club de France in Paris on January 20th, his subject being "London to Paris by Jet Plane." The problems and possibilities of operating pure jet transport aircraft over short ranges were presented with characteristic lucidity. The Air Commodore introduced his subject by observing that the distance from London to Paris is about 225 miles and that this distance can be covered in thirty minutes by an aircraft powered by simple turbojets. "Is it," he asked, "worth it?"

Some people, he said, argued that since the traveller has been something like two hours in travelling to and from the airports at each end, and waiting about, a saving of half an hour in three hours was not of great importance. There might, he confessed, be some truth in this from the passenger's point of view, unless there were other advantages, such as increased comfort and safety, and reduced fares; but from the operator's point of view, to be able to do the journey in half an hour instead of an hour meant a very big increase in the revenue-earning capacity of an aircraft, unless the increased speed had to be paid for heavily in reduced payload.

Speed and Efficiency

There followed a summary of the advantages of the turbojet as compared with the piston engine and airscrew, and a dissertation (the substance of which is already familiar) on thrust and power characteristics, weight and fuel consumption of the turbojet. Under the last heading one point invited special attention, namely, that at 600 m.p.h. the thrust horse-power was nearly three times its value at 200 m.p.h. but the fuel consumption was only 1.3 times. This brought up one of the most fundamental characteristics of the turbojet—the dependence of overall efficiency upon forward speed. Air Commodore Whittle explained that a figure of 1.21 lb/hr/lb thrust at 600 m.p.h. corresponded to 0.755 lb/t.h.p./hr, which was almost certainly lower than could be obtained with a piston engine and airscrew at that speed. Thus, even at high speed at sea level the turbojet was at least equivalent to the piston engine and airscrew in overall efficiency. At height there was a substantial improvement due to the effect of low air temperature.

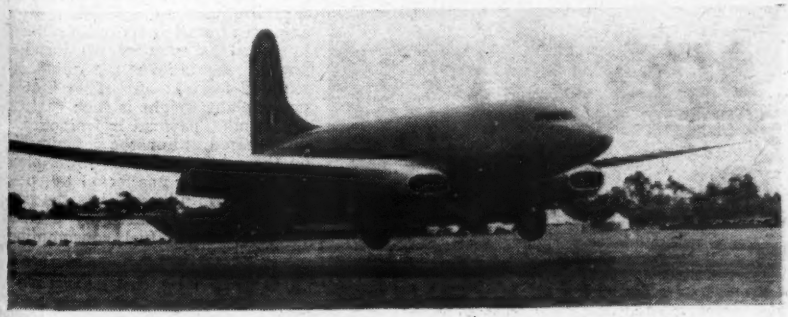
There were plenty of signs, said the lecturer, that the turbojet was going to live up to its promise of providing far greater reliability and less need for maintenance than the reciprocating engine. Already experience in R.A.F. fighter squadrons had shown that the man-power required for servicing and maintenance is about one-third of that for piston engines. There were signs that a much lower figure than this would be obtained in time. Several recent endurance runs in Britain indicated that servicing and maintenance would require less than one man-hour per engine in 10,000 miles of flying. There would also be a large reduction in the man-power required for servicing the airframe, etc., because a large proportion of troubles experienced were caused by engine vibration.



The Fokker F-26 Phantome project (Two R.-R. Nenes)

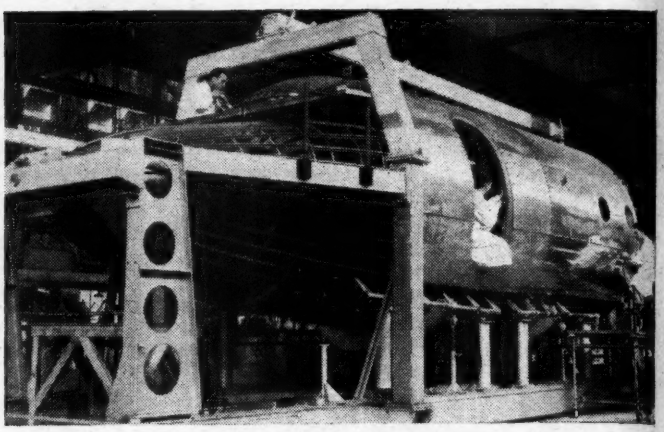
Considering the question of first cost, A. Cdre. Whittle considered that there was a tendency to assume that the cost of the turbojet would be about the same as that of the piston engine. He had no doubt, however, that for comparable quantities the turbojet would be cheaper, and in the case of types with centrifugal compressors, very much cheaper.

It had to be admitted that operating conditions which required fuel reserves to be carried for long periods of stacking at low speeds and low heights were very adverse to the jet aircraft which must fly fast and high for good



The Avro Tudor VIII (Four R.-R. Nenes)

Jet Liners for Short Range .....



Here shown in the jigs, the C-102 is rapidly taking shape at the Malton, Toronto, factory.

fuel economy. These aircraft could afford fuel reserves for head winds, course deviations, etc., but not for long periods of low-level stacking. When the lecturer spoke in Brussels recently, he assumed that it would be some years before the stacking problem would be eliminated, but as a result of what he learned during his recent visit to the U.S.A. he was much more optimistic. He found that at busy airports, like La Guardia and Chicago, enormous improvements had been achieved in one year. For example, at La Guardia the number of flights cancelled due to traffic congestion in instrument weather was reduced from 3,877 to nil, and the number of delays due to the same cause was reduced from 4,582 to 555. At the same time the average delay was reduced from 33 minutes to 11 minutes.

These improvements were obtained in spite of the fact that the permissible weather limits had also been greatly reduced. The advance had been achieved by the use of G.C.A., I.L.S., and a number of improvements in control procedure and adjustment of schedules. If the stacking problem could be solved at La Guardia, maintained the Air Commodore, then the application of similar methods should solve it at any airport in the world. In any case, he was considering a very short flight, such as London-Paris, where the time in the air need be little more than 30 minutes. Under these circumstances it should be possible to arrange that clearance for take-off was not given unless and until a guarantee was forthcoming that the aircraft could land without delay. This alone would remove the stacking problem on such flights. Nevertheless, in subsequent comparisons he made some allowance for stand-off time.

Performance Assumptions

For the purposes of a performance comparison between the turbojet and the piston engine the following assumptions were made:

(1) *Aircraft Drag.*—That for the jet aircraft the maximum lift/drag ratio was 16 and occurred at an indicated air speed of 170 m.p.h. At that speed profile drag and induced drag were both half of the total drag, and for other speeds profile drag was proportional to the square of the speed, and induced drag inversely proportional to the square of the speed. For the piston-engined aircraft the same induced drag but a 20 per cent greater profile drag at each speed was assumed.

(2) *Structure Weight.*—For the piston-engined aircraft the figure was taken as 35 per cent (this corresponded to the Airspeed Ambassador). For the jet aircraft the figure was 34 per cent (which was slightly higher than for the Avro C-102).

(3) *Weight of Crew, Equipment, Stores, etc.*—The figure assumed for the piston-engined aircraft was 10 per cent and for the jet aircraft 8 per cent (the first figure was lower than for the Ambassador and the second was higher than for the C-102—the difference between the two was accounted for by sundry small items such as lubricating oil, stores and small savings on the provisions for passenger comfort made possible by shorter journey times).

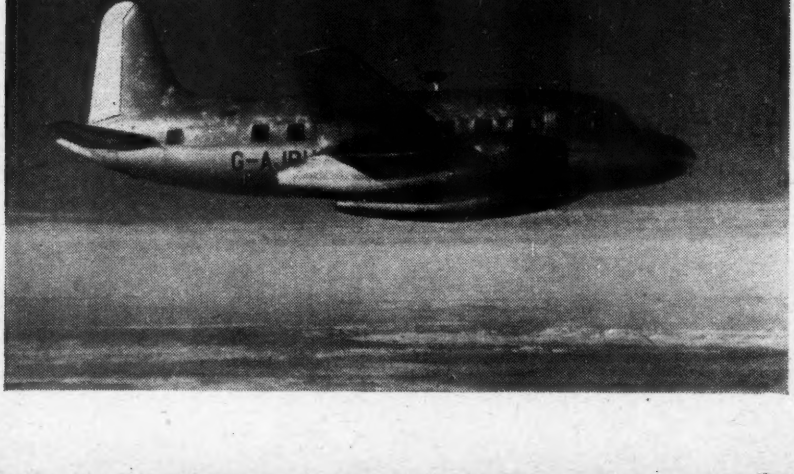
(4) *Power-plant Weight.*—Take-off thrust not less than 30 per cent of take-off weight. For the piston engine the installed power was determined by the take-off power (take-off thrust = 3 lb per take-off brake horse-power), as long as the designed cruising speed did not exceed 250 m.p.h. Above that speed the installed power was determined by the power required for cruising. The installed power-plant weight was assumed to be 2 lb per take-off horse-power or 3 lb per cruising horse-power, whichever was greater.

(5) *Fuel Weight.*—In both cases fuel weight was taken as the sum of that required for the flight at the speed concerned plus an allowance for 15 minutes' stacking at 200 m.p.h. plus 100 miles diversion allowance at 200 m.p.h., plus 5 minutes at take-off power. (This last was sufficient for a distance of about 40 miles in the case of the piston-engined aircraft or 60 miles in the case of the jet aircraft.) In both cases it was assumed that the flight was made at low altitude—the drag and consumption figures were for sea level. For the piston engine the fuel consumption assumed was 0.6 lb per thrust horse-power hour. For the jet engine the assumed fuel consumption was 1 lb per hour per lb of thrust for take-off and speeds up to 300 m.p.h., with a slight increase to 1.06 lb at 350 m.p.h. and to 1.12 lb at 400 m.p.h.

Weight Distribution Effects

A. Cdre. Whittle said that he regarded many of these assumptions as being unfavourable to the jet engine—especially the low operating height. The available evidence indicates that the difference in drag between the two types would be substantially greater than is assumed. Also, he believed that the fuel consumption figures for the jet engine could be reduced for an engine designed specifically for low cruising fuel consumption at the speeds and heights considered. However, in the case of stacking at 200 m.p.h., the thrust power required is so low a proportion of the full power that, in order to keep the consumption down to 1 lb per hour per lb thrust or below, would require a four-engined aircraft to be flown on two engines plus the use of variable area propelling nozzles.

A comparison between the weight distribution of the two types of aircraft at various speeds is illustrated in the diagrams of Fig. 1. These diagrams show very clearly that the capacity payload of the piston-engined aircraft is seriously reduced by speed as soon as the installed power rises above the minimum required for take-off. The effect of power-plant weight is such that, at 350 m.p.h., payload has practically disappeared. For the jet aircraft, on the other hand, the power-plant weight remains unaffected by speed up to 400 m.p.h., so that the payload is only penalized by a small increase in the fuel consumption.



The Nene-Viking, first turbojet airliner in the world to fly.

Since the revenue-earning capacity is proportional to the product of speed and payload, these diagrams suggest at once that the jet aircraft is a much more economic proposition.

The lecturer then examined the operational cases. For the purpose of cost estimates, the Air Commodore said he had relied very largely on the figures quoted by Mr. P. G. Masefield in his Commonwealth and Empire Lecture, given in September, 1948, when he divided costs into three divisions, namely, (i) fixed costs, (ii) hourly costs, and (iii) landing costs.

A. Cdre. Whittle said that he had deviated from this slightly by separating out fuel and oil costs from the other hourly costs.

For fixed costs, he had taken Masefield's figure of £3,360 per ton of gross weight per year for the piston engine, and 91.5 per cent of this figure for the jet aircraft. This reduction for the jet he justified on the grounds that the maintenance overheads would be greatly reduced, and the power-plant costs are reduced by the cost of the airscrews; otherwise, all the fixed charges are assumed to be the same in the two cases. He believed that fixed overheads for the jet aircraft would, in fact, be substantially less than those assumed, but stated that it would be seen that, for the short distance under discussion, fixed costs are demonstrably a relatively small proportion of the total costs.

Landing costs had been assumed to be the same in the two cases, and the figure given by Masefield, namely, £100 per landing cycle for an aircraft of 50,000 lb all-up weight, had

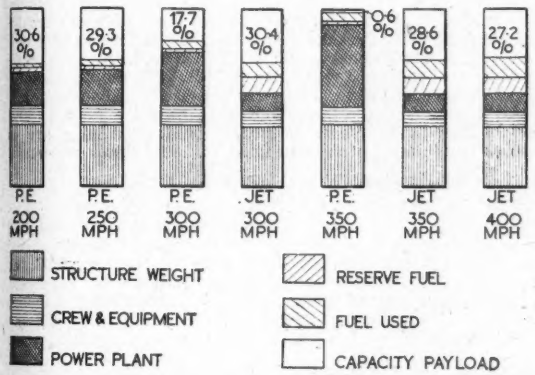


Fig. 1. Weight analyses of piston-engined and turbojet aircraft for varying flight speeds.

been taken. (Masefield quotes the figure as £4.5 per ton of gross weight per landing cycle.) This means that the landing costs are directly proportional to the product of speed and utilization.

For the hourly cruising costs, other than fuel and oil, Masefield's figure for the piston-engined aircraft had again been taken, but the figure for maintenance for the jet aircraft had been reduced to a little more than half.

For a 50,000-lb aircraft, these assumptions give £23.9 per hour for the piston-engined aircraft, and £17.4 per hour for the jet aircraft. The same figures for crew salaries, insurance, etc., had been assumed in both cases. The difference between the two figures is accounted for entirely by reduced maintenance costs. Even so, the Air Commodore believed that the reduction for jet aircraft would be greater than he had assumed.

For fuel and oil costs, he used the figures quoted by Masefield, namely, £0.1 per gallon for petrol, £0.25 per gallon for lubricating oil, and £0.057 per gallon for kerosene.

The annual revenue per aircraft equals capacity payload × load factor × speed × utilization (hours per year) × revenue per ton-mile of payload. In both cases, he had taken the capacity payload corresponding to the weight diagrams of Fig. 1, and assumed a load factor of 65 per cent, a utilization of 2,000 hours per year, and a revenue of £0.25 per ton-mile of payload carried.

Costs and Revenue

The costs and revenue for each type of aircraft for various designed operating speeds are illustrated in the diagrams of Fig. 2. The following points stand out:

(a) The piston-engined aircraft can show an excess of revenue over costs of between 34 and 37 per cent up to speeds of 250 m.p.h. At a speed of 300 m.p.h., revenue is reduced to 81 per cent of costs, i.e., there is a substantial loss because of the big reduction of capacity payload due mainly to the increased power-plant weight.

(b) With the jet aircraft, the revenue exceeds costs very substantially for all the speeds considered, though the percentage excess is reduced from 49 per cent to 32 per cent as speed is increased from 300 to 400 m.p.h. It would, therefore, apparently be somewhat more economic from the operator's point of view to operate at the lower speed.

(c) In terms of the capital equipment invested, the jet aircraft shows a far greater return than the piston-engined type. Even at twice the flight speed, the return on the capital is of the order of 60 per cent more.

(d) Landing costs are by far the largest item in short-stage operation.

Value of Special Purpose Design

It might be surprising to see that the piston-engined aircraft can show a profit at all at any speed over the short distance considered, because it is well known that every airline loses heavily on very short-stage lengths. The reason is that no modern aircraft has been specifically designed for these short-stage lengths. Thus, for example, the Airspeed Ambassador has a capacity payload of 21.4 per cent, whereas for this short-stage length a piston-engined aircraft especially designed for it could have a capacity payload of about 30 per cent. A reduction to 21 per cent would turn the profit shown in the

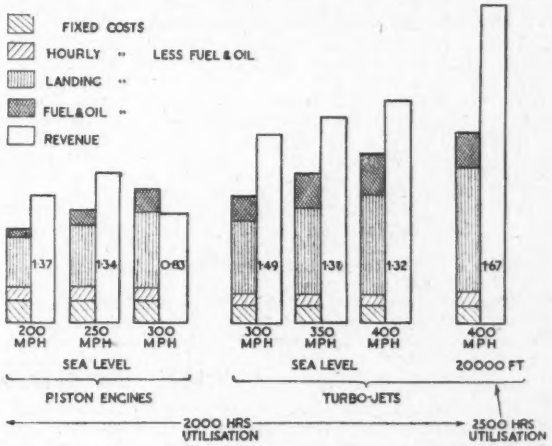


Fig. 2. Cost and revenue analyses per aircraft per year for piston-engined and turbojet types.

left-hand diagram of Fig. 2 into a loss of about 5 per cent of costs.

Whereas, according to Masefield, more than two-thirds of the landing costs are station costs, A. Cdre. Whittle said he found it hard to believe that this element of the landing costs would go up in proportion to the number of landings. If he was right, the increase of landing costs with increase of speed should be less than that shown, in which case it would probably be more economic to operate the jet aircraft at the higher speeds.

The lecturer stated that it had been his aim to show that the jet aircraft is superior to the piston-engined aircraft on this particular route, even under the least favourable conditions, and that the comparison had therefore been based on the major assumption that neither aircraft is operated at heights much above sea level. This assumption scarcely affects the piston-engined aircraft up to speeds of 250 m.p.h., but is unfavourable to it at higher speeds. However, it is much more unfavourable to the jet aircraft. For example, the jet type could climb to 20,000ft in about five minutes and at that height, owing both to reduced aircraft drag and reduced specific fuel consumption, the fuel used would be greatly reduced. This would result in an increase in the capacity payload for the route on one hand, and a large reduction in fuel costs on the other.

Up to that point he had assumed equal utilization in both cases. The figure of 2,000 hours per year might seem rather low, but it had to be remembered that few people will want to travel on this route between, say, midnight and 8 a.m. Nevertheless, in taking the same figure for both types, the lecturer thought he had been very unfair to the jet aircraft.

Jet Liners for Short Range . . . . .

It is probable that reduced maintenance and repair will permit a substantial increase of utilization, even allowing for the fact that most of the routine servicing and maintenance on both types would be done during the hours of very low traffic demand. The Air Commodore suggested that the figure for utilization could be increased to 2,500 hours for the jet aircraft.

The right-hand diagram of Fig. 2 gives an estimate of the effects of greater utilization and of operating at 20,000ft. Fuel costs are reduced despite the increase of utilization. Revenue exceeds costs by 67 per cent, and the annual profit is about three times the cost of the aircraft. This obviously represents a point at which a big reduction in fares would be possible.

The most striking fact illustrated by Fig. 2 is the very large turnover for short-range operation. This is, of course, due largely to the high values of capacity payload. For the piston-engine case, the turnover is of the order of three times the first cost of the aircraft. In the case of the jet, it is much more. With the right-hand diagram of Fig. 2, the total revenue is 7½ times the first cost of the aircraft (assuming that the first cost is £3 per lb of all-up weight in each case).

A. Cdre. Whittle stated that it might be thought that he had selected the London-Paris route because this is the one which shows up the jet aircraft to greatest advantage. This was far from the truth. He had selected this route primarily because it is one on which it is particularly difficult to make a profit, and he hoped that he had succeeded in showing that the jet aircraft could turn this money-losing route into a money-making one. The economic advantage of the jet becomes even greater at medium ranges. For example, consider twice the distance. Calculation shows that, if the jet aircraft were operated at its most economic height, the fuel consumption would be no greater for the double distance than for the single distance at the same speed at sea level, i.e., the capacity payload would not be affected. Revenue, fixed costs, fuel costs, etc., would not be affected for a given utilization, but the landing costs would be reduced to half. This would raise the profits from about 3 to 4.3 times the first cost of the aircraft. It is obvious that the piston-engined aircraft would also benefit, but owing to the small reduction in load capacity, and the relatively smaller effect of halving the landing costs, the proportionate effect is much less.

In conclusion, A. Cdre. Whittle said that he had neglected many small points which could be used to make the case for the jet aircraft more favourable. For example, he had made no allowance for the fact that, for the same take-off weight, the landing weight of the jet aircraft would be about 10 per cent less than that of the piston-engined aircraft, but on the other hand it could well be argued that the coarseness of the assumption did not justify such refinements.

DOROTHY SPICER MEMORIAL FUND

SINCE the opening of the Dorothy Spicer Memorial Fund by the Society of Licensed Aircraft Engineers, the Dorothy Spicer Memorial Prize Essay Committee, responsible for the supervision of the Fund and the conducting of the annual contest, has received donations to the Memorial Fund from the following: Miss Alice Williams, C.B.E., Miss M. T. P. Ward, Lt.-Col. G. E. B. Stephenson, H. P. Folland, M.B.E., F.R.Ae.S., F.I.Ae.S., F.R.S.A., Miss P. Pearse, S/L. E. A. N. Spicer, Mrs. E. A. N. Spicer, D. G. Thorpe, the Air Registration Board, British Overseas Airways Corporation, C. C. Wakefield and Co., Ltd., de Havilland Aircraft Co., Ltd., Flight Refuelling, Ltd., Flota Aerea Merchante Argentina, Old Godolphin Association, Rolls-Royce, Ltd., Rotax, Ltd., Shell-Mex and B.P., Ltd., and the Society of Licensed Aircraft Engineers. The Dorothy Spicer Memorial Prize Essay Committee consists of the following persons: D. G. Thorpe, A.R.Ae.S., M.S.L.A.E. (Technical Manager, T.K.S. (Aircraft De-icing) Ltd.); S/L. E. A. N. Spicer (Brother of the late Miss Dorothy Spicer); Miss P. Parker, A.M.S.L.A.E. (Maintenance Engineer); R. E. Hardingham, O.B.E., A.F.R.Ae.S., A.M.S.L.A.E. (Secretary of the Air Registration Board); N. Luke, A.R.Ae.S., M.S.L.A.E. (Chief Eng. Inst., Air Service Training, Ltd.).

Although substantial donations have been made, the Fund is still considerably short of the £1,000 deemed necessary to make the annual contest in memory of Miss Spicer perpetual.

AIRCRAFT GOLFING SOCIETY

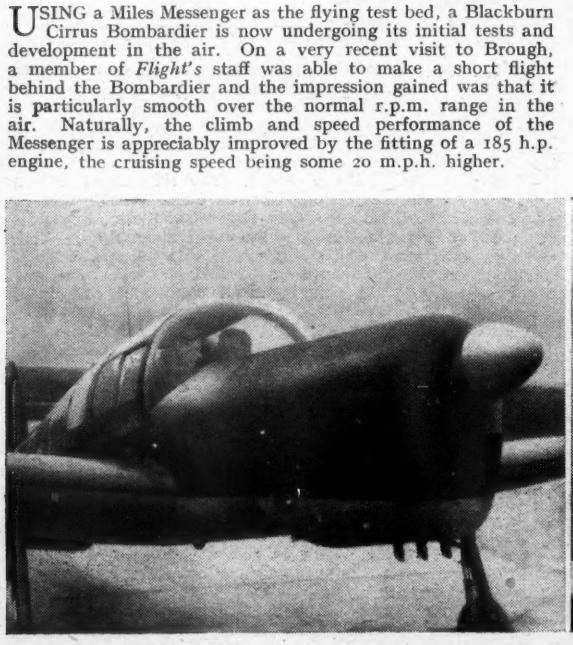
MR. LESTRADE BROWN, the new President of the Aircraft Golfing Society, will take the chair at the annual general meeting of the society on Wednesday, February 23rd, at Sheeky's Restaurant, St. Martin's Court, London, W.C., at 6.30 p.m. The fifth annual dinner of the society is to be held at the Martinez Spanish Restaurant, Swallow Street, London, W., on Friday, March 11th, and there is a Spring Meeting and Captain's Prize at Liphook Golf Club on Sat., Mar. 19th.

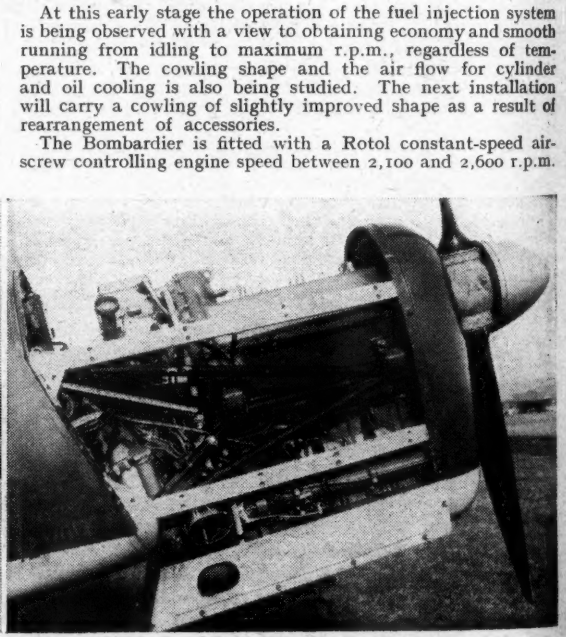
THE BOMBARDIER FLIES

USING a Miles Messenger as the flying test bed, a Blackburn Cirrus Bombardier is now undergoing its initial tests and development in the air. On a very recent visit to Brough, a member of *Flight's* staff was able to make a short flight behind the Bombardier and the impression gained was that it is particularly smooth over the normal r.p.m. range in the air. Naturally, the climb and speed performance of the Messenger is appreciably improved by the fitting of a 185 h.p. engine, the cruising speed being some 20 m.p.h. higher.

At this early stage the operation of the fuel injection system is being observed with a view to obtaining economy and smooth running from idling to maximum r.p.m., regardless of temperature. The cowling shape and the air flow for cylinder and oil cooling is also being studied. The next installation will carry a cowling of slightly improved shape as a result of rearrangement of accessories.

The Bombardier is fitted with a Rotol constant-speed airscrew controlling engine speed between 2,100 and 2,600 r.p.m.





Running up the Bombardier-Messenger before take-off at Brough. (Right) The prototype installation with Rotol airscrew is neat but the appearance will be improved for the second engine by lowering the cowling top line. Accessories seen on the rear top of the crankcase are, on later marks, located at the back of the engine.

HERE AND THERE

Russian Progress

ALEXANDER YAKOVLEV, the Russian aircraft designer, was recently quoted in *Pravda* as having stated that Russian aviation experts had solved the problems of building new types of aircraft and engines in their country. This statement was made in an address at a Communist party conference in Moscow; no further details were given.

Publicity Appointment

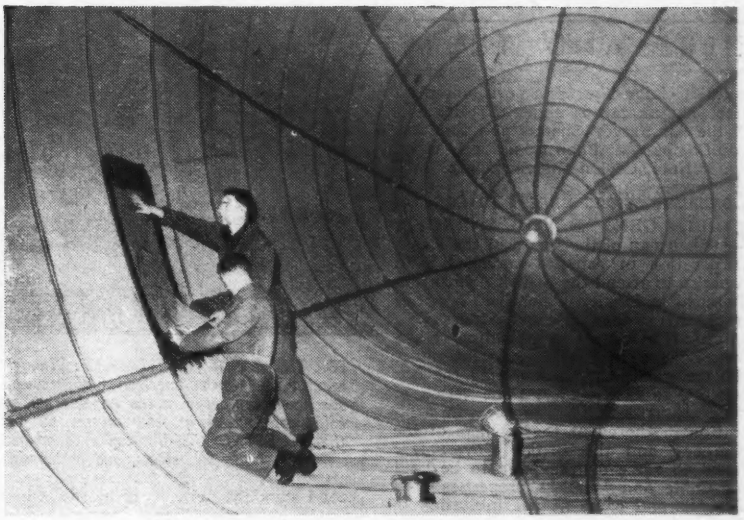
MR. DALE ARMSTRONG, formerly Director of Information to the Aircraft War Production Council and later of the Northrop Aircraft Corporation, is now stationed in London, having joined Foote, Cone & Belding, Ltd., to take charge of that company's Public Relations Department.

"African Enterprise"

THE Bristol Freighter *African Enterprise* which is engaged on a 17,000 mile demonstration tour of Africa, reached Accra, Gold Coast, from Lagos, on February 3rd, carrying nine passengers including Capt. Bartlett of the Bristol Aeroplane Co. When the aircraft landed at the Portuguese island of Sao Thome the crew were fêted and a public holiday was declared in their honour.

Bleriot Lecture

THE Royal Aeronautical Society reminds those wishing to attend the Second Louis Bleriot Lecture that this will be given this evening, February 10th at 6 p.m. at the Institution of Civil Engineers, Great George Street, Westminster, S.W.1. The lecture will be by M. Brocard and M. Hussenot on "French Practical Aerodynamic Methods." Non-members wishing to attend should obtain tickets of admission through members of the Society. Light refreshments will be served at 5.30 p.m.



SPIDER'S WEB: Members of the R.A.F. Balloon Unit at Cardington carrying out repairs to the inside of a barrage balloon. For this purpose the balloon has been inflated with air. It is at Cardington that the maintenance of balloons used for practice parachute drops is carried out.

Fairchild Developments

ENQUIRIES of the Fairchild Engine and Aircraft Corporation, New York, elicit the facts that none of its earlier piston engine designs is now in production. Instead, the productive facilities are being devoted to the manufacture of major components for the J-47 turbojet under General-Electric subcontract. The company is also developing three different types of power plants of a proprietary design, about which nothing further may be said at the present time.

K.L.M. Retirement

AFTER 28 years' service with K.L.M., Mr. Johannes Martin, vice-president (traffic) of the airline, is to retire on August 1st. He joined K.L.M. as general secretary in 1921 and afterwards headed the division which built up the 8,300-mile Amsterdam-Batavia service, for several years the longest in the world. In 1938 he became assistant vice-president, and was appointed vice-president (traffic) in 1946.

Boost for the B-36

ACCORDING to a report from America four turbojets are to be added to the six 3,000 h.p. Pratt and Whitney pusher piston engines of the U.S. Air Force's B-36 bomber, to give extra speed for combat and emergency.

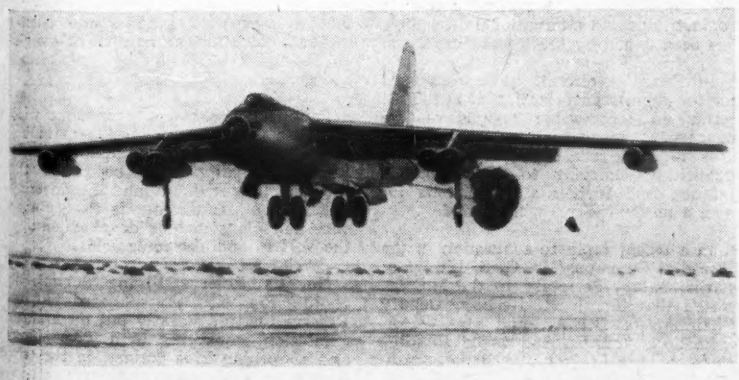
Built for the U.S.A.F. at the Fort Worth Division of the Convair Corporation, the B-36 is the largest bomber in the world, with a span of 230ft. A machine of this type recently lifted two guided missiles, together weighing 37½ tons, as reported in *Flight*, February 3rd.

New Dowty (Canada) Factory

MR. G. H. DOWTY has recently returned from a visit to Canada and the U.S.A. While in Canada Mr. Dowty completed arrangements to move the company's factory from Montreal to Toronto. He was accompanied by Mr. R. F. Hunt who will shortly return to Toronto to take over control of the new factory. Quantity production of fighter and bomber aircraft in that country will result in considerable business for the Canadian company now producing hydraulic equipment for the C-100 and C-102. The first set of Dowty equipment for the C-102 was manufactured in England at the company's Cheltenham factory and has now been shipped to Canada for installation in the prototype aircraft. During his visit to the United States Mr. Dowty made arrangements with four companies for manufacture under licence of many of the company's new products including liquid spring aircraft undercarriages.

Air Prospecting for Minerals

A DAKOTA belonging to Silver City Airways has arrived in Australia, where it is being used for a six-months' programme of mineral prospecting. It is equipped with the latest prospecting devices, including a magnetometer, which records magnetic curves showing where mineral deposits occur. The position of the aircraft is also recorded automatically by bearings from base station and radar; an accuracy of within 100 feet in 200



WHOAH!: A Boeing XB-47 Stratojet bomber is seen using a ribbon-type braking parachute attachment at Moses Lake, near Seattle. The purpose of this device, which resembles that used on the German Ar 234, is to enable high-speed jet aircraft to make landings on shorter runways.

HERE AND THERE

miles is claimed for this positioning device. The aircraft is under the direction of the Air Survey Charter and Exploration Company and flew from South Africa via Nairobi, Ceylon and Singapore.

Communications Expert in London

BRIG. GEN. DAVID SARNOFF, Chairman of the Board of the Radio Corporation of America travelled from America to attend the British Arbitration Tribunal in London which held hearings in the case of the Cable and Wireless Co., a privately owned organization taken over by the British Government under the Nationalization Bill, during the last two weeks in January. The terms of the Nationalization Bill provides for arbitration in the event that owners of the company and the British Government failed to agree on the price to be paid for Cable and Wireless properties, and Gen. Sarnoff came at the invitation of British interests to testify for the Tribunal as an independent and impartial expert.

Avro Test Pilot Retires

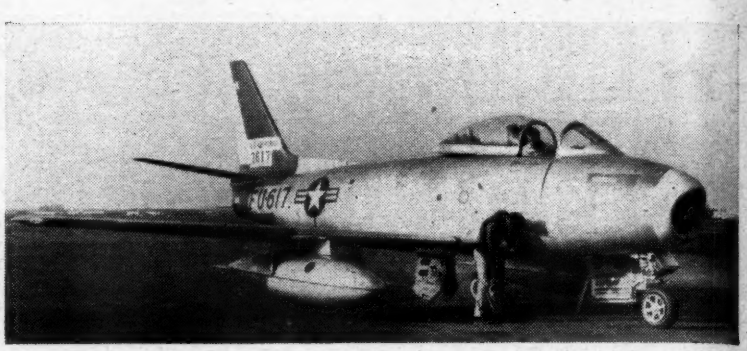
AT the end of January, Mr. A. K. Cook, D.F.C., left his appointment with A. V. Roe and Co., Ltd., at Woodford, to take up a business partnership. He joined the staff of the company as a test pilot in October, 1945, when he was demobilized from the R.A.F. Mr. Cook passed out from Halton, where he was an R.A.F. apprentice in 1931. After

Mr. A. K. Cook, D.F.C.

joining No. 83 Squadron as a Sergeant-pilot in 1937, he was commissioned in 1940, and completed his first tour of operations. After a period of instructing he completed a second tour of "ops" with 83 Squadron on Manchesters. After a further period of instructing he was selected for the first Empire Test Pilot's Course, and on completion of this was seconded to Avro's for production testing of the Lancaster.

F-86 For Canada

WHEN the Canadian Defence Minister, Mr. Claxton, announced that Canada was negotiating for the production, under licence, of an American jet fighter, *Flight* suggested that the North American F-86 was a likely choice (January 6th issue). Confirmation of this reasoning is supplied by a report from Canada that this aircraft will, in fact, be the Dominion's standard single-seat fighter. According to the U.S. journal *Aviation Week*, the R.C.A.F.'s



FOR THE GREAT NORTH WEST: Though holder of the world's speed record at 670.981 m.p.h., the North American F-86 "swept-back" fighter is no hot-house flower. The specimen seen above at Los Angeles has been sent to Ladd Field, Fairbanks, Alaska, for cold-weather trials at temperatures 50 degrees below zero. This view, incidentally, is the first to show the drop-tanks to advantage. It will be seen that there are bracing struts, and horizontal fins for safer jettisoning.

second standard fighter will be the twin-jet Avro-Canada C-100 two-seat all-weather fighter. This aircraft is stated to have been completed, and to be undergoing its test programme; power units are quoted as two Rolls-Royce Avon axial-flow turbojets of 6,500 lb static thrust. The journal also mentions the possibility of installing the Avon in Canadian-built F-86s.

College of Aeronautics Lectures

DURING the period March 7th to March 18th a course of lectures on "The Aerodynamics of the Helicopter" will be given at the College of Aeronautics, Cranfield. The first week will be devoted mainly to problems of performance and the second week to dynamics, stability and control. The fees for the course are 8 guineas for one week and 15 guineas for the whole course. A charge of 15s per day covers board residence.

A general course on "Aerodynamics and Fluid Mechanics" will be given at the College from May 2nd to May 6th, for which the fee is 7½ guineas, board residence being available at 15s per day. Copies of the syllabuses and forms of registration can be obtained from the Registrar, College of Aeronautics, Cranfield, Bletchley, Bucks.

Royal Aero Club Films

MEMBERS and Associate Members of the Royal Aero Club are reminded that the next film show at Londonderry House is to be held on February 15th beginning at 6.15 p.m. The show consists of two more coloured films screened by Mr. William Courtenay called "The Pacific Air Route" and "With the U.S. Marines at Iwo Jima." The first film is a record of a journey aboard a U.S. destroyer which Mr. Courtenay made during the war from San Francisco to Pearl Harbour and on by air from Honolulu through the Pacific islands of Enderbury, Canton, Fiji and New Caledonia to Australia. The second film is a vivid action record, also in colour, showing an amphibious assault in 1945 on the island of Iwo Jima, 750 miles south of Japan. Air, sea and land forces are shown in action in this campaign which cost the Americans almost 5,000 dead and the Japanese about 21,000 dead. Those wishing to attend this film show are advised to arrive punctually, and refreshments will be available before the programme begins.

News in Brief

PART I of the Competition Rules, which applies to racing, aerobatic competitions and international air rallies, has been issued by the Royal Aero Club.

* * *

In Rumania aircraft have been used for the rapid transportation of anti-T.B. serum to inaccessible regions of the country. The vaccine, which deteriorates rapidly, has been distributed in quantities sufficient to treat 500,000 infants, and further air shipments for over a million people will be made.

* * *

In a recent reply to a question in the House of Commons Mr. G. S. Lindgren, Parliamentary Secretary to the M.C.A., stated that Mr. J. H. Keeling, Deputy Chairman of B.E.A., and Mr. W. A. Edmenson, C.B.E., had asked to forgo their salaries as from April 1st, 1948. This public spirited offer had been accepted.

* * *

An American owner of a Ryan Navion, Mr. J. Chesebrough, of California, has installed radio-telephone apparatus in his aircraft by means of which he is able to talk to business colleagues and clients in their offices. The equipment weighs 29 lb and cost (including installation) 210 dollars.

* * *

Following the recent agreement with the Tata Organization for the manufacture of Ekco radio in India, a newly formed company is to be called the National Ekco Radio and Engineering Co., Ltd. Manufacture is to begin at once and plans include developments in the V.H.F. and electronic fields.

* * *

No. 25 Reserve Flying School, in conjunction with the affiliated No. 45 Reserve Centre, recently put on a static exhibition, consisting of a Tiger Moth and a working Link trainer, in the window of a local store. This exhibition drew 83 applications for membership of the R.A.F.V.R., and the show is to be moved to other towns in the next few months.

"Flight" photograph.

A flight of Prentices pass over the imposing buildings of the R.A.F. College at Cranwell. In the background is part of the north airfield.

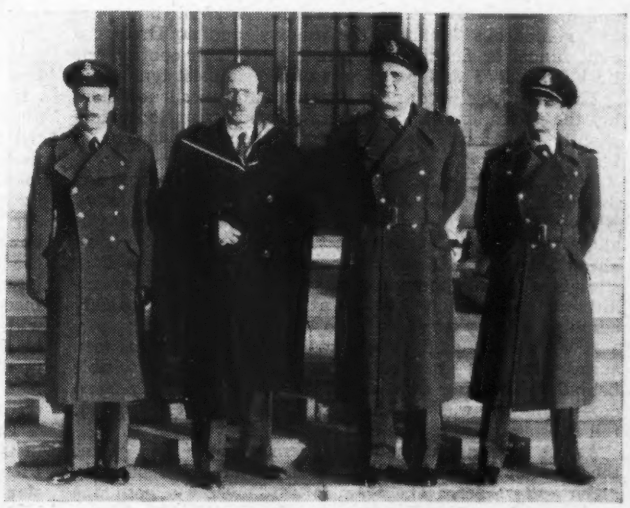
Wide Syllabus for Officer-Training To-day

SINCE His Majesty The King visited Cranwell in July last year to present the Royal Colour, the Royal Air Force College has received a new Commandant and new basic training aircraft. An opportunity was afforded last week for a brief visit to Cranwell to meet the Commandant, to see the cadets at work and to hear how the Percival Prentice has been received by the instructors and their pupils. Air Commodore G. R. Beamish, C.B., C.B.E., one-time Cranwell cadet and recipient of the Sword of Honour, also a former Irish and R.A.F. Rugby Football Captain, is the new Commandant. He replaced A. Cdre. R. L. R. Atcherley who has become A.O.C.-in-C. Pakistan Air Force. Air Commodore Beamish stated that returning to Cranwell after 25 years he found the standards very high and the structure of the organization ready to stand up to any tests.

As a result of the break during the war years when Cranwell became a flying training school and the College was closed, the new entries of cadets have the job of re-establishing the magnificent reputation enjoyed by the college in pre-war years and to which witness was borne by the outstanding war record of nearly one thousand ex-cadets. Pre-war Cranwell is well remembered by many, but too little is known of its aims, work and successes by the young men now at school who might well be attracted by the unique training and opportunities it offers. There are certain important differences between the old and new arrangements, principal among which is the fact that the cost of training is now borne by the State instead of by individual parents. The period of training now covers eight terms, or two years and eight months, instead of two years.

A very high standard is required to qualify for entry, and it is in part due to this that only 246 of a possible total of 320 cadets have applied and qualified for training. Regrettable and alarming though this reduction in intake undoubtedly is, it would be more regrettable to have to reduce standards to effect an increase in numbers.

In case there is any misapprehension, it must be stressed that Cranwell is a college in the fullest sense—not a flying school with expanded syllabus. Cadets are trained to become Royal Air Force officers with the highest possible



Senior members of the College staff are (left to right) W/C. R. J. P. Pritchard, O.B.E., D.F.C., A.F.C., M.A., the C.F.I.; Mr. Patrick Johnson, O.B.E., M.A., director of studies; A. Cdre. G. R. Beamish, C.B., C.B.E., newly appointed Commandant; and G/C. J.O.W. Oliver, D.S.O., D.F.C., Assistant Commandant.

"Flight" photograph.

A Day at Cranwell . . . . .

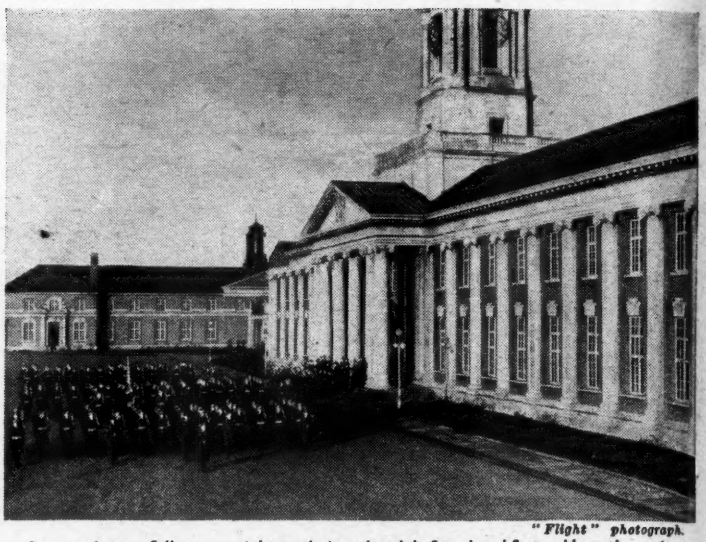
qualifications and standards in all respects. Their grounding will fit them to take advantage of every opportunity and rise to the top ranks. The college staff are specially selected for their knowledge and example.

During the first two terms—and this is an innovation—cadets live under airmen's conditions, and so learn to appreciate the airman's point of view. During this time they continue with fundamental education and many additional subjects including practical work on aircraft and components. They also spend a high proportion of their time becoming fit and smart. Flying is limited to a dozen or more hours of air experience including elementary map reading, navigation and the like, while passengers in Ansons.

After two terms, an entry of cadets moves from barrack blocks into college premises, and flying instruction commences on the newly-acquired Prentices. Lectures on aerodynamics, thermodynamics, radar, contemporary history, history of warfare, modern languages, etc., continue, and sports and flying take up a fair proportion of the cadets' time-table.

Cadets in their senior terms find themselves accommodated in the College proper, and in addition to their academic studies and expanded flying programme they assist in the training of the junior entries. The later stages of flying training are still carried out in Harvards, pending the delivery of a later design, such as Athena or Balliol.

During part of the holiday periods between terms cadets have the opportunity to take part in exercises and manœuvres with the Army and at sea with the Navy, to go to skiing and gliding camps abroad, and to enjoy other such instructive and healthy pastimes.



"Flight" photograph.

On occasions, a full ceremonial parade is ordered before breakfast. Here the cadets parade the King's Colour at slow march before the College buildings.

A good deal of study and reading are required outside working hours. The Director of Studies believes in keeping set lectures to the morning period, so far as is possible, and encouraging cadets to find out for themselves how best to employ their unsupervised time. There are musical, dramatic and engineering societies, and riding, sports and swimming to help occupy the few leisure hours available to a cadet. Life at Cranwell is hard but good, and the training given could scarcely be bettered.

Some additional details and illustrations of training at the Royal Air Force College will be published next week.

PRENTICE BY NIGHT

Handling Qualities of the New Basic Trainer

AN opportunity was afforded recently to fly a Prentice at night. Initiation into the art of night flying and elementary instruction in night circuits are a very important part of a pupil's training, and the qualities of a new basic trainer are of considerable interest.

Conditions were good except for an occasional shower, and the night was very clear and dark. A double flare path of "goosenecks" marked the runway, and no Drem circuit, funnel or floodlight was in use. Circuit control was by V.H.F. R/T and patter was of the simplest type.

The Prentice's wide, deep screen affords excellent vision, but the permanent amber in the roof and screen top give a slightly oppressive super-dark impression—two shades of black in fact!

After completing the take-off check, obtaining permission to take-off at the taxy post, and receiving the confirmatory Aldis "green" from the control van, the Prentice was aligned and gently opened up. All the flares were visible ahead from the starboard seat, and the aircraft was kept straight with the minimum of effort. We seemed to become airborne rather more quickly at night and were quickly climbing steadily away.

A left-hand 1,000ft circuit was made and the final turn across wind was executed as the first flare became visible behind the trailing edge at the wing tip. A fairly steep cross-wind leg was started with half flap (at the gate), full fine pitch and a trickle of power.

As the turn-in was made and permission to land given, the angle-of-approach indicators came into view showing green and amber. The view forward over the nose was exceptionally good. Full flap was lowered and the Prentice crossed the boundary steadily at about 70 m.p.h. with green showing on the A.A.I.s. So gentle is the round-out that the instinctive check as the ground "comes up" is sufficient to prepare the aircraft for landing. As there is no tendency to balloon, bounce or swing after touch-down the landing itself is very simple.

Two, or possibly three, improvements could be made to the Prentice for both night and day flying, and at least one of these is now in hand. In rain the screen becomes treacly and forward vision is reduced almost to zero. An effective screenwiper is therefore required, and an example already fitted to a Percival demonstration machine is reported to function well. The second improvement concerns the coaming over the instrument panel, which restricts the pilot's view of certain essential dials. This weakness is known to the makers and was pointed out in an "In the Air" series article in *Flight* of June last year. Nothing, however, has been done. Finally, and less important, is the lack of foot rest for the man who is not flying. According to the size of the man concerned this may be a matter of inconvenience or definite discomfort. We cannot agree with some pilots that it is in order for an instructor to rest his feet, or even toes, on the rudder pedals all the time his pupil is flying. If he draws his knees up to place his feet level on the floor, aileron movement of the stick is restricted, particularly if in the portside seat.

There seems little doubt that both instructors and pupils in the R.A.F. are in general very pleased with their new Prentices, which offer a degree of comfort and permit a standard of equipment previously unattainable in any initial trainer.—M.A.S.

CIVIL AVIATION IN THE LORDS

Lord Pakenham Gives an Account of his Stewardship : Corporations Have Been Set a New Target

THE House of Lords spent the afternoon of February 2nd in debating Civil Aviation. The Motion was in the name of Viscount Swinton, who called attention to the administration of Civil Aviation and the reports of the Corporations.

VISCOUNT SWINTON thought the loss incurred by the Corporations was in the region of £11 million, but that this figure did not include everything, and that there were hidden subsidies. For instance, there was the item of loaned or leased aircraft. The depreciation of such aircraft must be borne by somebody, presumably by the Ministry of Civil Aviation. He also wanted to know the proportion of the cost of development and research. In last year's Estimates for Civil Aviation a figure of £10 million was given. Then there was the cost of airfields, and of the Ministry itself.

Of the latter Viscount Swinton said that he thought the cost of staff alone was in excess of £1 million. He hoped the Minister would give a real aggregate cost of civil aviation, but in the meantime he himself had estimated that at least £16 million would have to be added to the Corporations' deficits of £10 to £11 million. If that were so, the true bill to the taxpayer for the year would be not less than £26 million.

Lord Pakenham

Lord Swinton welcomed the decision to let the Corporations buy their aircraft from the makers. That was a point for which he had pressed for the past two years, and the Corporations had pressed it in their reports.

In the matter of flying British aircraft, Lord Swinton said, B.E.A. in their report paid a deserved tribute to the Viking, and they had announced their decision as to its successor, and as to Dakota replacements. All were to be British. Of B.S.A.A. plans it was difficult to speak at this moment. They had suffered a grievious loss in the death of Air Commodore Brackley, and now they had had the Tudor accident.

B.O.A.C. had had a difficult problem, Lord Swinton said. He hoped they had now on the stocks really good aircraft, using jet engines and gas turbines, and we ought to press forward with these machines with all speed and in close consultation with the Commonwealth countries. He stressed the collaboration with the Commonwealth countries because it was important to get back the parallel partnership, using the same kinds of aircraft.

Lord Swinton regretted that the Government had discarded the partnership with the shipping lines. He asked for comparative figures for British and European airlines, the cost of airfields on internal routes, and at how many R.A.F. airfields there was common use with civil aviation. He also dealt with the charter companies, and said he understood that in some cases the Corporations had charged a commission of as much as ten per cent for the privilege of running a service.

Referring to the Transport Advisory Council, Lord Swinton quoted from the Minister's directive, and asked why the monopolistic companies should insist on maintaining high prices. He also criticized the limit of two years on associate agreements, and suggested that since aircraft obsolescence was based on five years, the agreements should also be for that period.

Lord Swinton concluded by discussing the future of the Ministry of Civil Aviation. He thought it should be merged with the Ministry of Transport, as the reasons which compelled the formation of the Ministry in 1944 no longer applied.

LORD PAKENHAM, Minister of Civil Aviation, thought the House would require from him a fairly full account of his stewardship—some kind of progress report, but first he would like to deal with the charter companies and the licensing authority. He quoted from the statement by the British Air Charter Association (to which we referred last week—ED.) by way of showing that the charter companies felt that they had come pretty well out of the new proposals.

Turning to Lord Swinton's suggestion that the Ministry of Civil Aviation should be merged with the Ministry of Transport, Lord Pakenham thought Lord Swinton would be greatly mistaken if he imagined that such a merger would greatly reduce the total number of staff.

The total net Government expenditure on civil aviation in 1948-49 was expected to be about £24 million, not including development expenditure. Of this total, some £15½ million was for current expenditure and £8½ million for capital expenditure. The losses this year were certain to exceed the £8 million limit, so to be safe they should add another £1 million to the £15½ million, bringing the total for all purposes up to about £25 million.

In reply to a question by Lord Swinton, Lord Pakenham said that this figure took account of all development which would be met by the Corporations. The £7½ million of current expenditure, apart from losses of the Corporations, represented the direct and indirect cost of operating and maintaining airfields and ground facilities at home and abroad, and any headquarters expenses of his own Ministry which could not be allocated to those purposes.

Of the £8½ million capital expenditure, £3 million represented the residual cost falling on the Government during the present year for aircraft manufactured in this country. That was not all loss, but £2 million of it must be attributed to the unhappy saga of the Tudor. The remaining £5½ million represented expenditure on the development of runways and airports, equipment for radio stations and so on. The largest item in capital expenditure was £2 million for developing London Airport.

When dealing with the affairs of the Corporations, Lord Pakenham said that their losses for 1947-48 were slightly over £11 million, compared with some £10,600,000 for 1946-47. He declined to judge the year 1947-48 principally in terms of losses or deficit. From the point of view of the Corporations it was a year of rapidly expanding business. The volume of operation was substantially greater than during the previous year. Capacity ton-miles flown increased by 37 per cent. And in everything that pertained to the quality of the services rendered, the prestige of the Corporations throughout the world was second to none.

Reduction in Costs

In the case of B.O.A.C., cost per capacity ton-mile fell from 76.2d to 68.5d. In B.E.A.C. the cost fell from 145.5d per capacity ton-mile to 90d. In spite of this, more was lost than in the previous year. It might be asked why. An answer often given, and which he did not altogether repudiate, was that civil aviation is not, broadly speaking, a paying proposition. American airlines, the personification of private enterprise, were losing a lot of money.

On the North Atlantic B.O.A.C. was competing on equal terms. The Corporation had obtained a higher aircraft utilization and higher load factors than their competitors. Had B.O.A.C. been able to operate with modern aircraft on all its routes, the losses would have been £1½ million instead of £6½ million. Compared with foreign operators, the British airlines had been working under four pronounced handicaps: aircraft, dispersal of bases, flying uneconomic routes to provide social services, and excessive costs which had grown up during the period of initial development, and for which the Corporations were the first to recognize there could be no further excuse.

Lord Pakenham dealt with these in some detail. He referred to " his friends in the aircraft industry," and was proud to be able to do so. He had not found, when he took office, that relations between the industry and the Corporations were as happy as he could have wished, but now that the big aircraft controversy was out of the way, he noted with approval and pleasure that a real reconciliation was taking place.

While on the subject of aircraft, Lord Pakenham referred to the use by Dutch, Belgian and French companies of American aircraft of relatively few types. By comparison, B.O.A.C. had no fewer than 11 different types, some of which were flying boats. During the period before the Brabazon, the Saro boats, the D.H. Comet and the others came into service, B.O.A.C.'s fleet would be rationalized under four types: the Hermes, the Canadair, the Constellation and the Stratocruiser.

Having finished his progress report, " whose keynote was steady progress," Lord Pakenham turned to the future. During 1949-50 we should see visible effects of the great efforts made by the Corporations to improve their overall efficiency.

Civil Aviation in the Lords . . . . .

After prolonged discussions it had been decided to link Birmingham with Paris with a daily service, starting at Manchester and run on alternate days by B.E.A. and Air France. He was informed the service would break even if a Dakota could achieve a 70 per cent load factor. It was now up to the Midlands to see that the service was used. He had also decided to authorize an experimental Welsh service, operating a D.H.89 on Liverpool-Hawarden-Cardiff-Hawarden-Valley one day, and in the reverse direction the next day. B.E.A. had warned the Minister that even if the aircraft were filled every time, the service would be uneconomical, but he considered it worth trying.

Lord Pakenham finally announced that he had decided to set the Corporations a target for the year 1949-50. He had called on them to reduce their deficits from £11 million in 1947-48 and £9 million or so expected for 1948-49, to £5½ million, without retarding the normal expansion of services. He visualized a revenue of about £27½ million and an overall expenditure of about £33 million. He believed that civil aviation, like other industries, was all the better for knowing what was expected of it.

VISCOUNT TEMPLEWOOD put in a strong plea for Government support of the flying clubs. (We may recall that Lord Templewood, when he was Sir Samuel Hoare, was the Secretary of State for Air who got the flying club movement going in 1924.—ED.) He reminded the House that when the movement started, a Government grant of £100,000 a year sufficed to pay for the grant for machines and for paying the clubs for every pilot turned out. The records showed that on the outbreak of war the machines were transferred to the R.A.F. for training, and the instructors were invaluable to the R.A.F. in the days when there was a great shortage of instructors. He spoke from personal experience when he said that one great advantage was that the clubs brought provincial cities and municipalities into direct contact with aviation. (Lord Templewood is president of the Norfolk and Norwich Aero Club.—ED.)

LORD GIFFORD strongly advocated the use of flying boats. He quoted a passage from a correspondence letter in *Flight* in which the correspondent referred to "landplane passengers being hurled across the world with more despatch than decency, in order to make the ordeal as short as possible." More seriously, he did not think passengers should be compelled to board an aircraft before 9 a.m. nor to arrive after 9 p.m. The comfort of marine aircraft contrasted with the discomfort of the landplane, and he would say without qualification that the Solent was by a long way the world's most luxurious airliner. At present Britain had an unchallenged lead in this form of air transport, and he would beg Lord Pakenham to have regard to the claims of the flying boat. There had been a very valuable export of British flying boats. In addition to the great Saunders-Roe S.R.45, he thought we ought to have a smaller type, say of about 100,000lb weight, as a replacement for the Solent.

LORD POLWARTH suggested two ways in which B.E.A. could reduce the cost of uneconomic services. He thought there were too large ground staffs at some of the airports where traffic was small, and then there was the question of aircraft types. He was informed that the de Havilland Rapide could not be operated economically. There was no other aircraft in which he would rather fly, and he felt extremely safe in a Rapide, but if the machine was uneconomical, steps should be taken to obtain a replacement. Nothing ambitious was wanted, but only an eight- or ten-seater. He was surprised that no specification had yet been decided upon, and recalled that Australia already posseses the Drover.

LORD BALFOUR OF INCHRYE said a position had now been reached where the very proposals put forward by the Opposition for the last two or three years have been adopted. As for the internal uneconomic services, he thought these need not be run on main trunk-route standards but could be run more economically "on a shoestring."

In referring to the new activities of the charter companies, Lord Balfour used the same expression as we did in our Editorial Comment last week. It was not "Thank you for nothing," but it was "Thank you for very little." He also pointed out, as *Flight* did, that the Minister has very autocratic powers in dealing with the charter companies.

In his reply LORD PAKENHAM promised to look into the matter of civil aviation sharing R.A.F. airfields. Of help for the flying clubs he could say nothing definite except that he was sympathetic. The matter concerned the Secretary of State for Air as much as it did the Minister of Civil Aviation, but he hoped to be in a position to make a statement in a month's time.

FLYING CLUBS DISCUSSED IN COMMONS

NUMEROUS questions were put to Mr. Lindgren in the House of Commons on February 2nd concerning the recommendations of the Working Committee set up to consider the financial difficulties facing flying clubs. Mr. Lindgren stated that the recommendations of this Working Committee had recently been received and were being considered. In reply to another question, Mr. Lindgren said that the report would not be made public but any decisions arrived at between the Ministry of Civil Aviation and the Treasury concerning the report would, of course, be made public. Mr. Edgar Granville stressed the seriousness of the present position and declared that many clubs would have to close down altogether unless immediate assistance was forthcoming. Mr. Beswick asked Mr. Lindgren to suggest to the Treasury that some assistance would be given within the next two months by the remission of the tax payable on petrol used by flying clubs. A. Cdre. Harvey then pressed the Parliamentary Secretary to the M.C.A. to hasten a decision since the matter had been under consideration for nearly two years. In reply to a question from Mr. Scollan on the supply of the cheaper type of light aircraft, Mr. Lindgren stated that his Ministry were interested in the point of view of the flying clubs and its effect on the light aircraft industry, and that the whole problem was being considered in conjunction with the Ministry of Supply.

FESTIVAL OF BRITAIN

FOR the Great Exhibition Centenary Festival of Britain, to be held in 1951, the Council of Industrial Design have been charged with the responsibility of selecting all manufactured articles to be shown. This applies not only to the main exhibition, which will be held in London as the centrepiece for the Festival, but also to the several travelling exhibitions and specialized displays which will be organized in the many provincial centres.

In order to provide a fund of contemporary informative data for the planners of the Festival, the compilation of a "Stock List" has already been started. This, briefly, is intended to provide a ready photographic index of the trend of British design. It is not intended that the list can be all-embracing or final, and the Council recognize that they must rely on the goodwill of the trade Associations, Press, and individual concerns if it is to be made comprehensive.

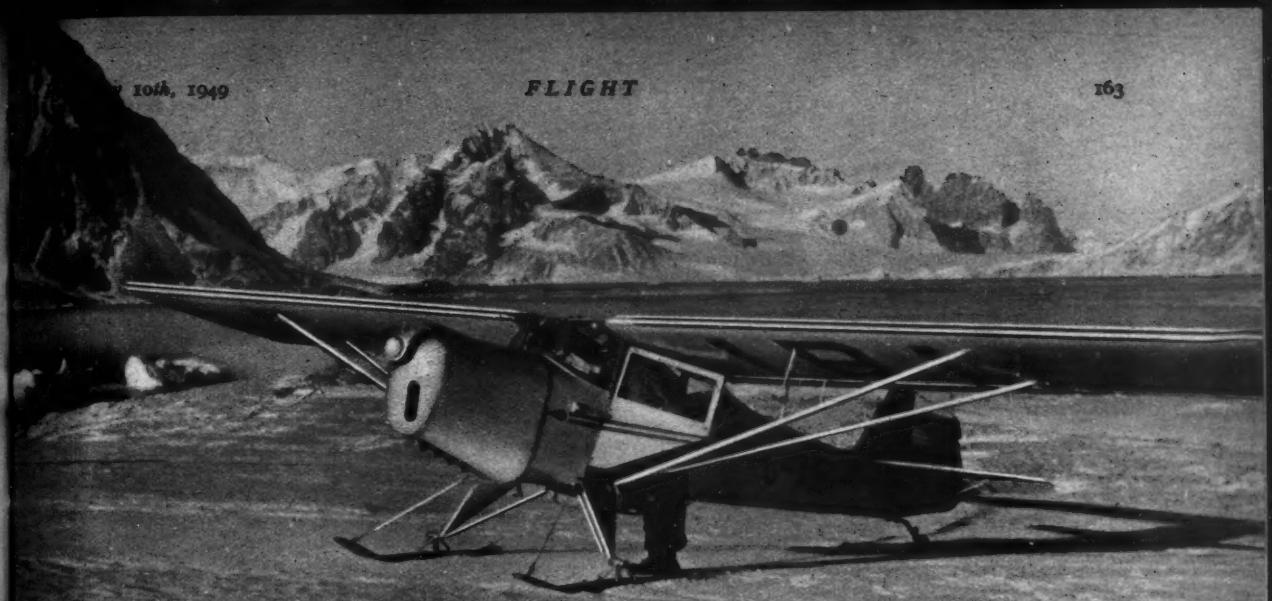
The Council are well aware that, in so far as aviation is concerned, the combination of fluidity of design, functionalism and security make the task of selecting items extremely difficult. The highly specialized nature of the field also imposes the selective stricture that the panel of selectors must necessarily have specialized advice. To this end, it is suggested that the manufacturers themselves should suggest and put forward for inclusion in the Stock List examples of what *they* consider to be their best work. The principle of selection is clearly stated: "The highest standard of contemporary design which must embrace functional, æsthetic and engineering qualities taken together."

Although all Associations serving industry are invited to help in bringing this appeal to the notice of manufacturers, the Council's Industrial Officers will pursue a policy of individual approach and personal contact to learn from manufacturers the many interesting developments which will deserve a place in the 1951 Exhibitions. These Industrial Officers are also at the service of any manufacturer requiring special help or advice over designs for 1951.

If so requested, the Council will treat photographs, samples or technical data as strictly confidential.

A.T.S. MESSAGES

IN Notice to Airmen No. 475 there appears a clarification of the type of message text which may be transmitted over the Aeronautical Telecommunication Service. Examples are given of those which are not regarded as normally within the authorized categories. These are: Lists of passengers' names; arrangements for hotel reservations or meals on landing for passengers or crew; requests for transport to meet passengers or crew; personal requirements of passengers and crew, including enquiries concerning luggage or personal property; individual advices to passengers relating to delayed flights, etc. An exception in the case of hotel reservations and requests for transport is allowed from aircraft in flight if necessitated by exceptional circumstances, such as a breakdown of the arrangements for the provision of meals during flight or diversion of the aircraft.



Antarctic Air Survey

The survey Auster at Marguerite Bay—territory administered by the Falkland Islands and claimed by Chile and Argentina.

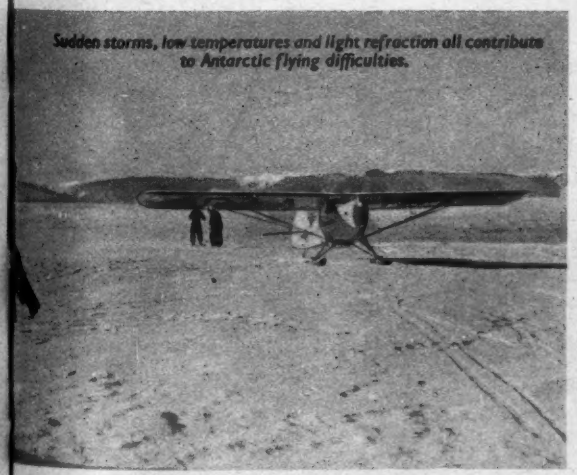
IN the Antarctic, 34 British explorers, members of the Falklands Islands' Dependencies Survey, are completing another season's survey work in Graham Land.

Last season, a ski-equipped Auster helped considerably not only in the survey work, but in depot-laying for the sledging survey parties, until, with F/L. Stonehouse at the controls, it made a forced landing on the Graham Land Ice Cap.

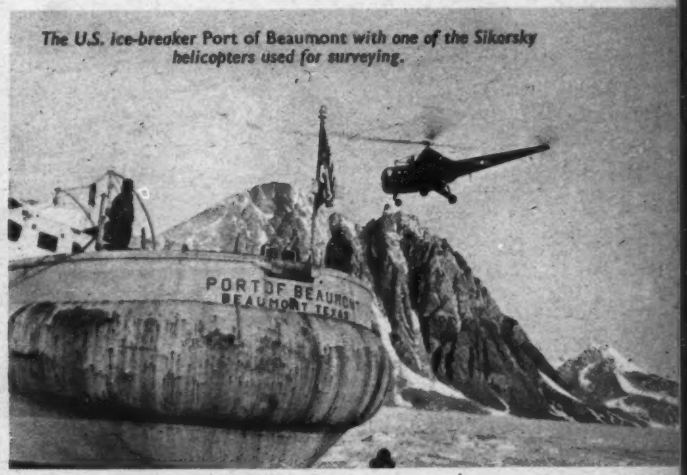
Working in conjunction with U.S. aircraft—based at Marguerite Bay and operating from ice-breakers—it stood up well to the extreme conditions. The Auster was shipped to Graham Land aboard the Polar supply vessel *John Biscoe*, and housed in a wooden hangar built by the explorers at Marguerite Bay. It is planned to replace the aircraft as soon as possible.

Meanwhile, it is announced that a Chilean expedition is on its way through the ice floes to establish a permanent meteorological and survey base near the British hutments.

Taxying through deep snow before take-off on a survey flight.



Sudden storms, low temperatures and light refraction all contribute to Antarctic flying difficulties.



The U.S. ice-breaker Port of Beaumont with one of the Sikorsky helicopters used for surveying.

No. 3 Fighter S

Squadron

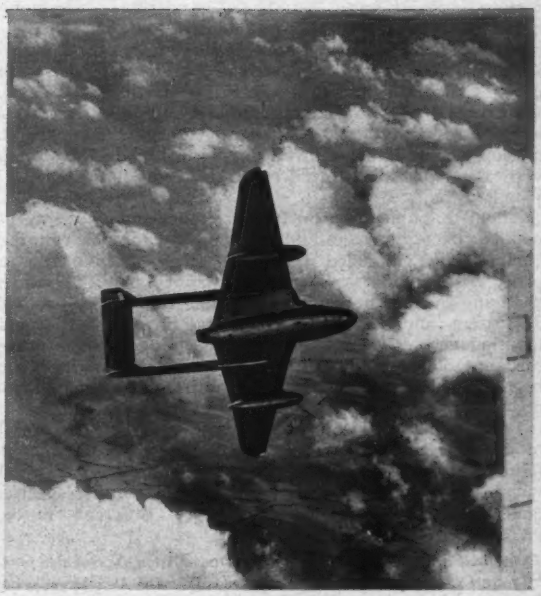
THESE impressive *Flight* photographs of Britain's premier "heavier than air" squadron, show that the unit's pilots still maintain as high a standard of piloting as that of their predecessors.

The photographic aircraft was a Harvard, and it speaks very well for the controllability of the D.H. Vampire I that, by the judicious use of flaps and throttles, a tight formation could be held at the Harvard's speed. When photography was finished, the three Vampires formated on the Harvard, with S/L. Macfie in the box, and returned home in perfect formation—making an impressive breakaway over base.

No. 3 Fighter Squadron, as No. 3 Squadron of the Royal Flying Corps, was one of the first units to go into action in the 1914-18 war, in fact, the very first operational flight ever to be made was flown by Lt. P. B. Joubert de la Ferté (now Air Chief Marshal Sir Philip Joubert) of No. 3 Squadron on a Bleriot, in company with Lt. Mapplebeck of No. 4 Squadron, who was flying a B.E.

Many of the officers who have served with the squadron during its long and distinguished history have reached high rank. A companion history to that of No. 1 Squadron (*Flight*, December 23rd, 1948) will appear in a forthcoming issue.

J. Y.



For the air-to-air photographs J 5 D was flown by the Commanding Officer, S/L. C. H. Macfie, D.F.C. F/O. E. C. Rigg piloted J 5 T and J 5 M was in the hands of PII E. C. Wheatley.

Power for Helicopters

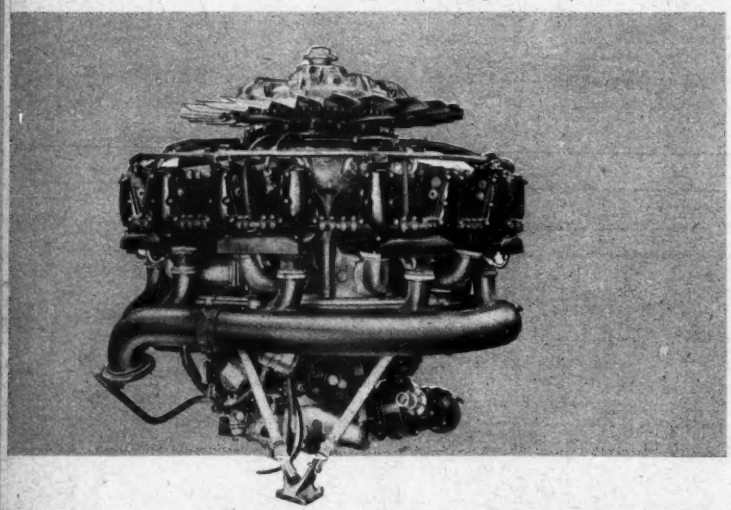
The Alvis Leonides 23.HM for the Bristol 171 : Requirements and Variants

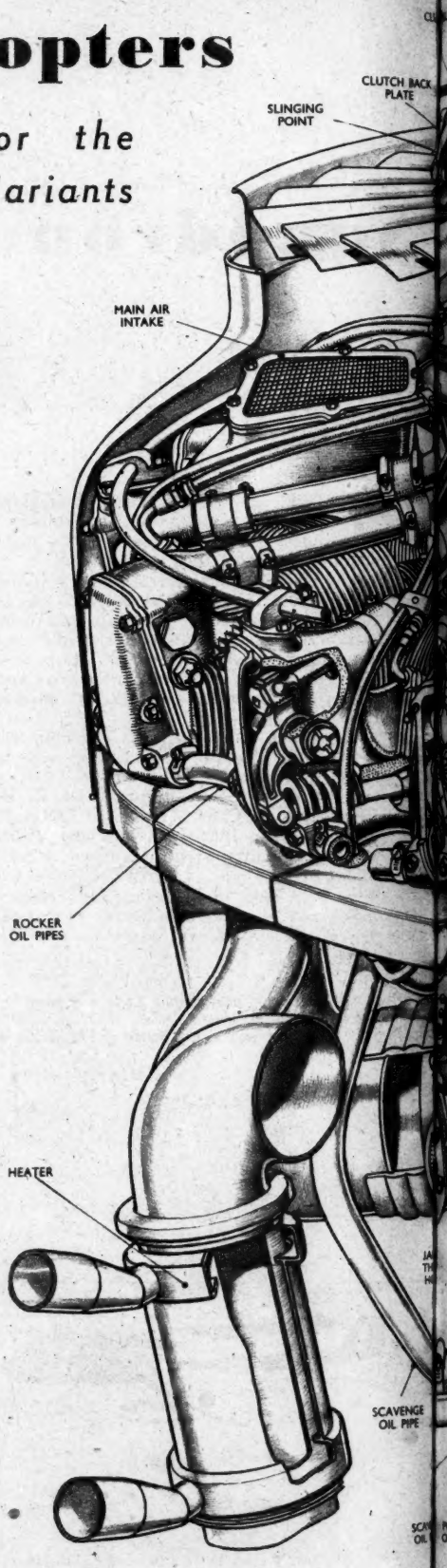
BRANDY should be old, cheese ripe and oysters fresh, but when does an aircraft engine design reach its prime? If it is new and up-to-the-minute a potential operator may be reluctant to risk saddling his company with a proportion of the development charges; at the same time he probably cannot wait for someone else to provide the operational experience and remove snags. If, on the other hand, the design is of long standing, there is the risk that to offset its known virtues it may lack new and beneficial features which are beyond the scope of normal development and modification. Talking over these considerations at Coventry recently the conclusion was reached that the basic Alvis Leonides engine is a design approaching its prime. The design conception embodies modern features—this is particularly true of its fuel injection system—yet the engine has a background of several years' running. Installed in its original Oxford and Bulldog test beds, subsequently in the Concordia, and now the Prince and a new Consul test bed, a good total of flying hours has been built up. As the power unit of the Fairey Gyrodyne it is already the joint holder of the world's helicopter speed record, while in horizontal installation (i.e., shaft vertically upwards) Leonides are installed in the Bristol 171s and Westland-built S.51s.

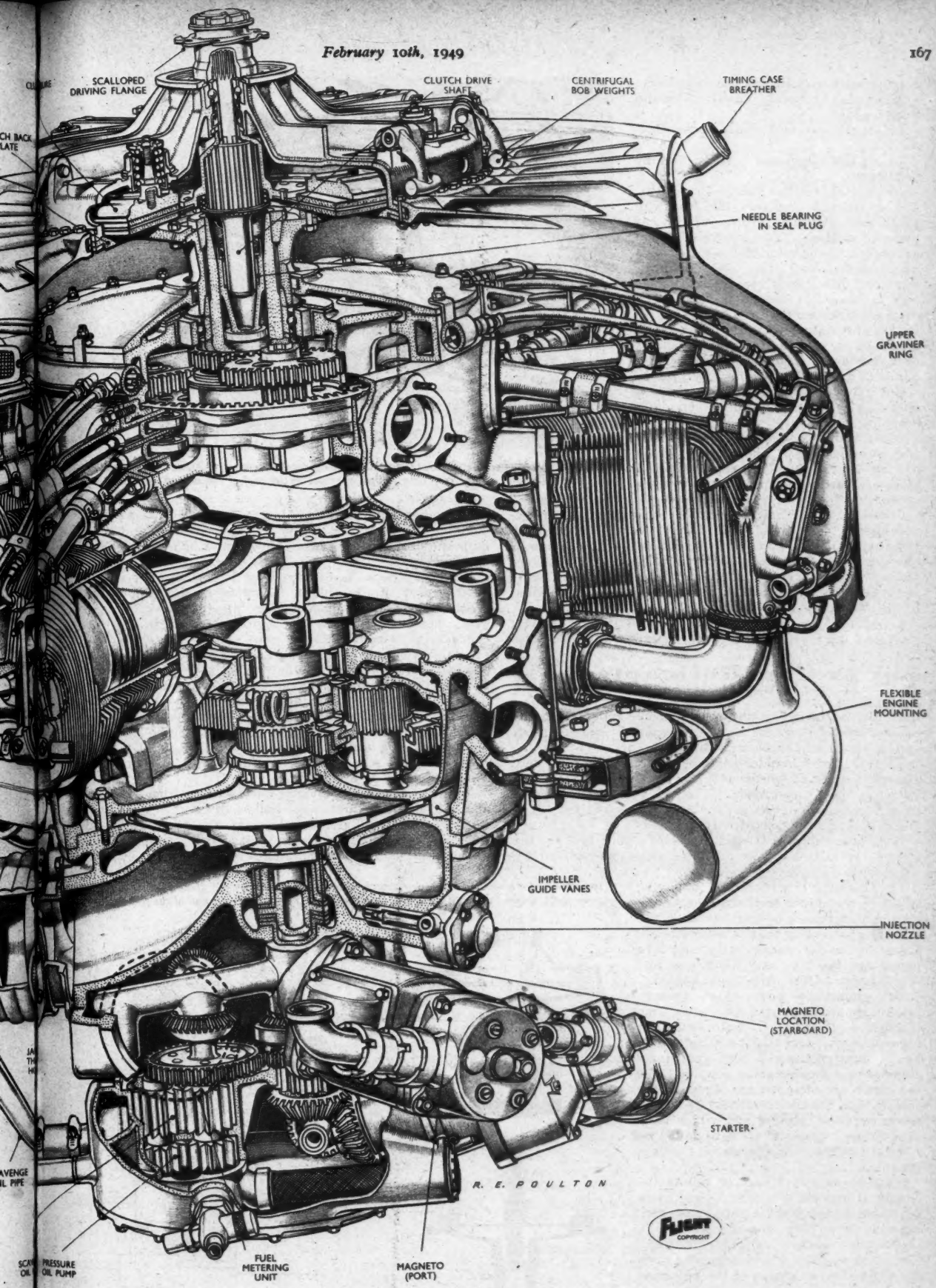
About this time last year *Flight* published a photograph and some details concerning the first tests of a Leonides running "on its back." This coincided with the start of intensive helicopter power plant development. Two chief points to be considered when changing over to horizontal operation are the need to redesign the oil system, and the question of engine changes and accessibility for maintenance. Obviously an engine change should not entail disturbance of the rotor shaft, head or controls. Good progress has been made in the intervening months, and engine availability is now keeping pace with helicopter airframe production.

From every point of view, however, it is desirable that the design of the Alvis helicopter engine so far as is possible should become more standardized. At present there are four types in existence, of which three are unavoidably different in many respects, the three helicopters they power being very different in conception.

Details of a helicopter power plant and transmission are revealed for the first time in this special "Flight" cutaway drawing. The Alvis Leonides depicted is the latest model 23.HM (short engine), especially developed for the Bristol 171. It produces 550 h.p. at full power and has many interesting features peculiar to its special duties. (Below) Prototype LE.23.HM helicopter power plant without its cowling and shrouding.






SCALLOPED DRIVING FLANGE
CLUTCH DRIVE SHAFT
CENTRIFUGAL BOB WEIGHTS
TIMING CASE BREATHER
NEEDLE BEARING IN SEAL PLUG
UPPER GRAVINER RING
FLEXIBLE ENGINE MOUNTING
IMPELLER GUIDE VANES
INJECTION NOZZLE
MAGNETO LOCATION (STARBOARD)
STARTER
R. E. POULTON
FUEL METERING UNIT
MAGNETO (PORT)
FLIGHT COPYRIGHT

Engine mark and aircraft are as follows:

WS.51.L (vertical shaft)—Westland Sikorsky 51.

LE.21.HM (vertical shaft)—early Bristol 171.

LE.22.HM (horizontal shaft)—Fairey Gyrodyne.

LE.23.HM (vertical shaft)—Bristol 171.

The WS.51.L replaces the American Pratt and Whitney Wasp, which has opposite rotation. To alter the direction of rotation of the rotor blades would be a major undertaking; the power plant is, therefore, fitted with reverse gearing as well as its 0.8:1 reduction gear. The lubrication system has been made suitable for the installation with the minimum of modification, and the rear cover remains near standard. A small production order has been placed for Leonides WS.51.Ls.

For Bristol 171s two horizontally operating units have been specially developed, namely, the 21.HM and 23.HM, known respectively as the long and short engines. The 21.HM, which has an earlier type of rear cover and accessory arrangement, is now being superseded by the 23.HM, which is 8in shorter due to an improved rear cover with integral sump, redesigned pumps and rearranged accessories. Certain important aircraft accessories—generator, vacuum pump, etc.—have, in fact, been removed to the rotor gear box above, where they are driven from the tail rotor shaft. Here, therefore, they remain operative for a forced landing in the event of an engine failure.

Completing the list of helicopter units is the LE.22.HM, produced for the Gyrodyne. This more nearly resembles

Power for Helicopters . . .

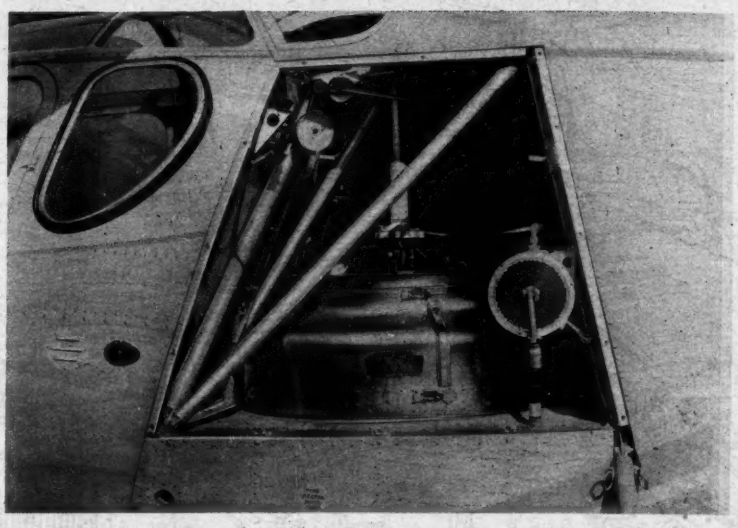
the standard Leonides 501 series in being mounted in the conventional vertical manner. No reduction gear is fitted, and accessories have been modified.

The standard Leonides engines, 501/1 and 501/2, were awarded type-test certificates in December, 1945, and January, 1947, respectively. The WS.51.L has completed its test and confirmation of type approval is awaited. The LE.23.HM has not yet been type-tested.

It is, however, this latest LE.23.HM (short unit) for the Bristol 171 with which we are principally concerned in the subsequent detailed description. The basic Leonides is structurally unaltered so far as the power section is concerned, although increased output has been obtained by increasing the r.p.m. and boost. Latest figures for maximum (5 min) S.L. power are 550 h.p. at 3,200 r.p.m. and +7 lb boost. Other data are tabulated.

To summarize power-plant features briefly, the main and tail rotor are driven through a "vertical" shaft extending between engine crankshaft and rotor gear box. Interposed are a large centrifugal clutch and a flexible shear coupling. To the clutch are attached the blades of the cooling fan. This circulates air downwards over the cylinder fins, which have close-fitting baffles and are surrounded by a metal cowling. A separate oil cooler is provided.

Starting with the front or top of the engine, it may be seen that the reduction gear housing has been replaced by a timing case cover plate, through which protrudes the standard splined crankshaft. The splines which would normally carry the main driving pinion of the reduction



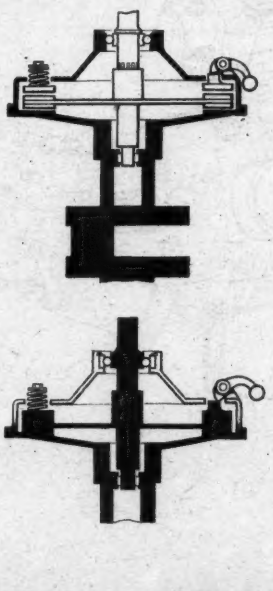
Cowled Leonides horizontally installed in the power compartment of a Bristol 171. Cooling air enters through a forward-facing grilled aperture in the roof of the engine compartment.

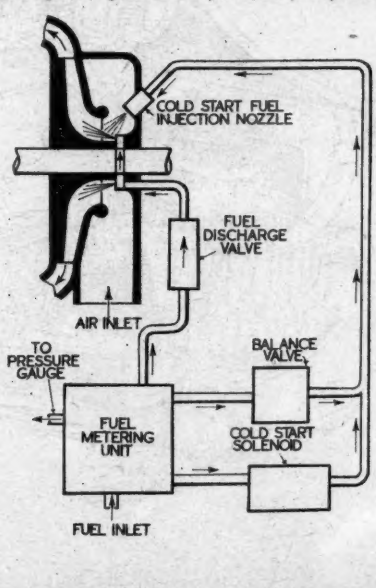
gear engage with an internal component in a short steel coupling sleeve. This sleeve is bronze-cone-mounted at each end and carries a flange to which is bolted the clutch back-plate.

Borg and Beck have played an important part in the development of the clutch, which is of the single-plate centrifugal type. Engagement is brought about by eight bob weights mounted on Torrington needle bearings; disengagement is controlled by four springs adjustably tensioned with the aid of their retaining nuts. The main clutch driving shaft is splined to the driving plate and again to the upper steel coupling sleeve. At its lower end it extends into the hollow crankshaft and is carried in a needle bearing, itself located in an "egg cup" sealing plug. The upper end of the main shaft revolves, when the clutch is disengaged, in a large ball race. A provisional engagement speed of 960 r.p.m. has been settled, and the rotors are completely free at 820 r.p.m.

A grease nipple is provided on the clutch driving plate which feeds through into the hollow drive shaft so that it can be packed with grease to lubricate the needle rollers at the lower end, from the inside, and also the main bearing at the upper end. A number of Angus seals prevent leak

The drive from crankshaft through clutch, disengaged and engaged (below left), to rotor drive shaft, shown in simplified form. (Below right) Diagrammatic layout of the fuel system.





age from the assembly and protect the clutch plates from the grease.

The whole power unit will be lifted with the aid of four eyes on the clutch driving plate.

Clutches of this type are new components in aircraft and do not lend themselves very well to aircraft constructional practice. A clutch required to transmit over 500 h.p. needs plenty of body in the back-plate and weight in the cast-iron pressure plate to give rigidity and absorb the heat generated. However, a nine-cylinder radial engine needs a small flywheel to run at low idling speed, and the clutch backplate, to which are attached directly the 24 cooling-fan blades, fulfils this function.

Above the clutch there is an interesting flexible shear coupling comprising the scalloped flange of the upper coupling sleeve already referred to, a series of *light alloy* bolts with which it engages, and eight steel cups bonded into rubber bushes through which pass bolts for attachment of the upper drive-shaft flange. This coupling is illustrated.

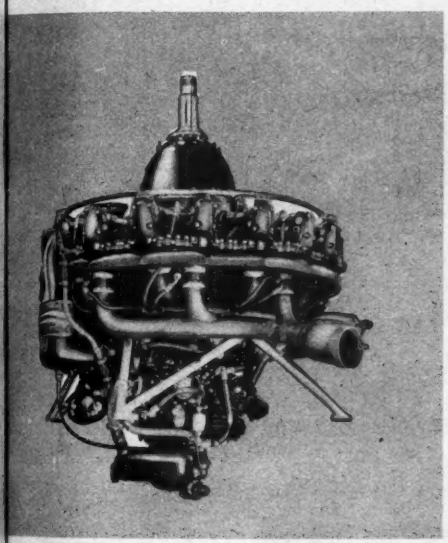
Good starting from cold, and steady idling speed, are engine features which assume special significance in a helicopter. Protection of the main rotors has always to be in

able air loads and be aerodynamically efficient. Quick-release toggle fasteners secure the four detachable sections, and the whole is supported on its square-section tubular ring by light tubular stays from the main crankcase bolts and the front cover plate studs. The cowling is located on the flanged edges of the baffles at the lower end and on small fibre blocks, attached to the rocker-box covers, which also support a Graviner extinguisher ring, at the upper edge. The cooling-fan shroud ring is separate from the cowling. The timing-case breather passes through the small annular space between cowling and shroud ring.

Air supply to the separate oil cooler is by-passed from the top of the engine, and it escapes through a separate port. The carburettor air intake is also fed from inside the cowling, close in to the centre line (between Nos. 5 and 6 cylinders). This results in a degree of centrifugal cleaning.

On the 23.HM the new accessory and pump arrangements are easily recognized. The accessories section carries the magnetos, fuel injection unit and boost control unit. The sump, or bottom cover, mounts the pressure and scavenge pumps, the r.p.m. generator and, almost horizontally, the starter motor. There is a triple oil union for entry, dilution

For the Westland Sikorsky helicopter the Leonides WS.51.L is fitted with a reverse and reduction gear, and a separate sump below the accessory casing.



The graceful Bristol 171 helicopter for which the Leonides 23.HM. has been developed.

mind. Intermittent slow running or fast idling for warming up may both be unacceptable for this reason and because of the presence of the automatic centrifugal clutch with its close limits on engagement speed. The Leonides helicopter units have a modified Hobson fuel unit which includes a special cold-starting system. The aim is to achieve smooth running when cold at 600 r.p.m. with throttle closed and with no speed increase as the engine heats up. Incidentally, the throttles are oil heated.

A good deal of research has been required to produce satisfactory cooling-fan blades. Airflow characteristics through the cooling system were examined, and it seems that some pulsation was detected. For this reason the simple pressed (twisted) steel blades were abandoned in favour of the present forged alloy type with forked roots which bolt to the clutch back plate.

For cooling purposes the engine is closely cowled. Air drawn in from above, ahead of the rotor gear box, is circulated over the cylinder fins and out over the accessories below and to the rear. The circular cowling is of much lighter construction (22 gauge) with simple, quite loosely fitting sections by comparison with the precision fit of a standard Leonides cowling, which must withstand consider-

and thermometer, and Graviner flame detector switches are also to be found on the rear cover.

Oil is only drawn from the valve gear of the lower cylinders on the standard Leonides; in the horizontal engines, "Y" drain pipes have been fitted to all the rocker-boxes, one scavenge pump has been eliminated, and there is a large external scavenge pipe from the position of the original between-cylinders sump. Furthermore, oil drainage occurs through the supercharger gears, extra holes being provided in the guide vanes (see illustration).

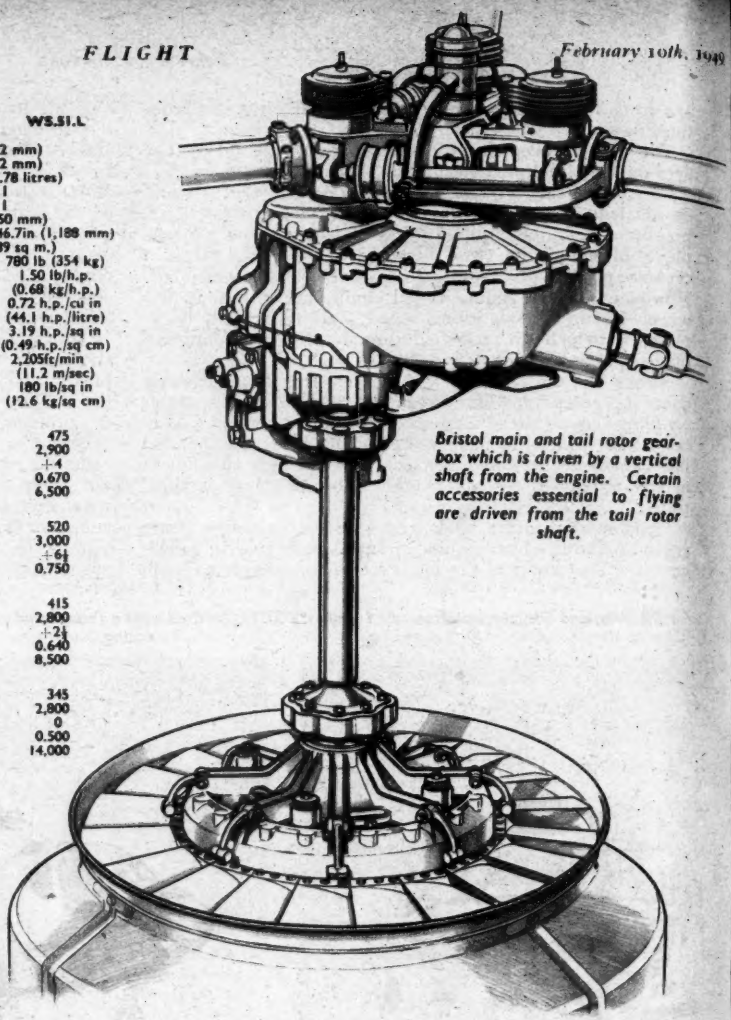
Mounting Features

Two Graviner extinguisher rings, one above and one below the cylinder bank, are provided, and some ingenious rearrangement of ignition harness has been necessary due to space restriction.

Mountings are different on each of the helicopter engines. On the 23.HM there are three main attachment bolts to the crankcase. Bristol designers claim certain virtues for the triangulated mounting which is illustrated. The mounting ring is supported by six tubular struts with ball-end attachments. The flexible portion, known as the Dynaflex

ALVIS LEONIDES ENGINE DATA

	LE.23.HM	WS.51.L
No. of cylinders	9	
Bore	4.80in (122 mm)	
Stroke	4.41in (112 mm)	
Capacity	718 cu in (11.78 litres)	
Compression ratio	6.8 : 1	
Supercharger ratio	6.5 : 1	
Overall diameter	41.4in (1,050 mm)	
Overall length	32in (814 mm)	46.7in (1,188 mm)
Frontal area	9.6 sq ft (0.89 sq m.)	
Weight	710 lb (322 kg)	780 lb (354 kg)
Weight/power ratio	1.29 lb/h.p. (0.59 kg/h.p.)	1.50 lb/h.p. (0.68 kg/h.p.)
Output displacement	0.76 h.p./cu in (46.6 h.p./litre)	0.72 h.p./cu in (44.1 h.p./litre)
Output piston area	3.38 h.p./sq in (0.52 h.p./sq cm)	3.19 h.p./sq in (0.49 h.p./sq cm)
Piston speed (max)	2,357ft/min (11.9 m/sec)	2,205fc/min (11.2 m/sec)
B.M.E.P. (max)	175 lb/sq in (12.3 kg/sq cm)	180 lb/sq in (12.6 kg/sq cm)
Maximum Power at Sea Level (1 hour)		
b.h.p.	490	475
r.p.m.	3,000	2,900
Boost pressure (lb/sq in)	+4½	+4
Fuel consumpt (pt/b.h.p./hr)	0.670	0.670
Altitude (ft)	7,000	6,500
Maximum Power at Sea Level (5 min)		
b.h.p.	550	520
r.p.m.	3,200	3,000
Boost pressure (lb/sq in)	+7	+6½
Fuel consumpt (pt/b.h.p./hr)	0.750	0.750
Maximum Continuous Power		
b.h.p.	400	415
r.p.m.	2,800	2,800
Boost pressure (lb/sq in)	+2	+2½
Fuel consumpt (pt/b.h.p./hr)	0.620	0.640
Altitude (ft)	9,500	8,500
Maximum Weak Mixture Power		
b.h.p.	330	345
r.p.m.	2,700	2,800
Boost pressure (lb/sq in)	0	0
Fuel consumpt (pt/b.h.p./hr)	0.500	0.500
Altitude (ft)	13,000	14,000



Bristol main and tail rotor gearbox which is driven by a vertical shaft from the engine. Certain accessories essential to flying are driven from the tail rotor shaft.

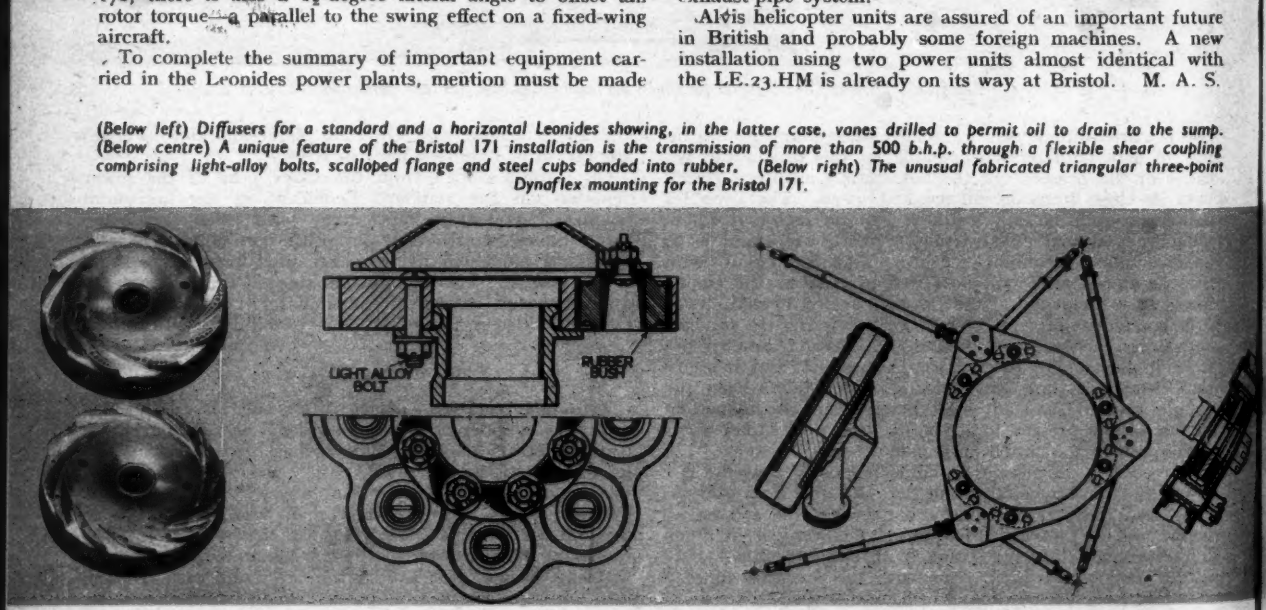
Power for Helicopters . . .

type of mounting, comprises steel plates bonded to rubber blocks which are held in pairs within each apex of the fabricated triangular mounting ring. The ring is made in two halves and welded around its centre line. End caps are then added. This type of mounting is compact, strong and fully flexible. It may be compared with the neat standard Dynafocul flexible mounting of the Westland unit.

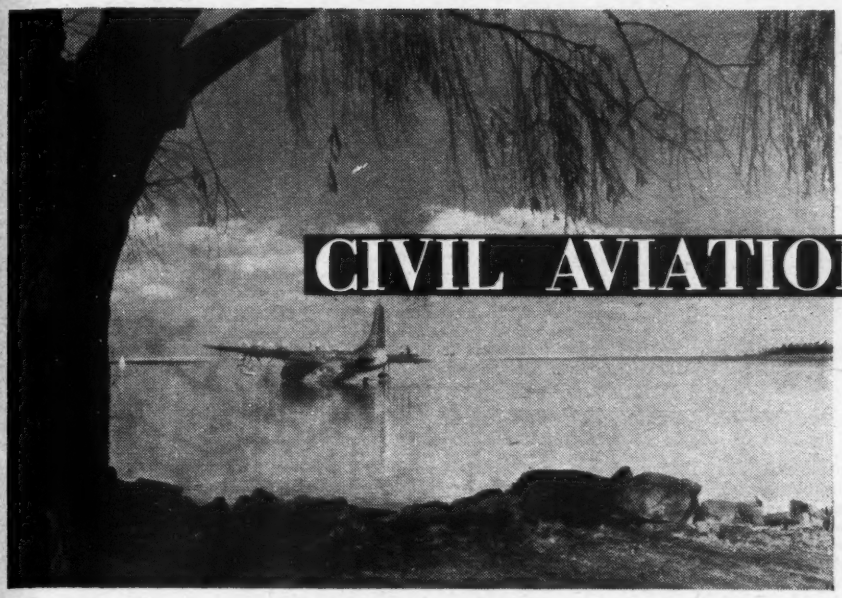
It is worthy of mention that in addition to the 6-degree forward sloping angle of main drive shaft of the Bristol 171, there is also a 1½-degree lateral angle to offset tail rotor torque—a parallel to the swing effect on a fixed-wing aircraft.

To complete the summary of important equipment carried in the Leonides power plants, mention must be made of the Gallay cabin heaters, either hot air or boiler type according to engine mark, which are included in the exhaust-pipe system.

Alvis helicopter units are assured of an important future in British and probably some foreign machines. A new installation using two power units almost identical with the LE.23.HM is already on its way at Bristol. M. A. S.



(Below left) Diffusers for a standard and a horizontal Leonides showing, in the latter case, vanes drilled to permit oil to drain to the sump. (Below centre) A unique feature of the Bristol 171 installation is the transmission of more than 500 b.h.p. through a flexible shear coupling comprising light-alloy bolts, scalloped flange and steel cups bonded into rubber. (Below right) The unusual fabricated triangular three-point Dynaflex mounting for the Bristol 171.



Corporations' Traffic in October

CIVIL AVIATION NEWS

American Safety Awards

SPRINGBOK SOLENT: A B.O.A.C. Solent moored on the lake at Vaaldam, the air terminal for the flying-boat service from Southampton to Johannesburg. South African Airways, in association with B.O.A.C., operate the landplane service to Johannesburg from London with DC-4 aircraft.

P.A.W.A. EXTEND TOURIST-RATE SERVICE

FROM March 1st Pan American Airways' tourist or "air coach" service between New York and Puerto Rico will be extended down the east coast of South America as far as Buenos Aires. This follows the earlier successful enterprise of P.A.W.A. to provide more economical air travel between New York and the Caribbean area, and the airline declares that its policy is to pass on to the public the savings resulting from more economical operations. It is claimed that the reductions effected by the "air coach" service will mean savings to the travelling public of more than a million dollars a year. The extension of the "air coach" service to Buenos Aires will result in a fare reduction of over 20 per cent to all points served by Pan American between there and New York. The tourist-rate flights between New York and Buenos Aires will be made with DC-4s carrying 52 passengers. No hot meals will be served but light refreshments will be available. The first-class service will also be flown with DC-4s but these will carry 30 passengers and be equipped with Sleeperette seating accommodation. Reductions in fares are also being offered to travellers using the first-class service on this route; when the fare between New York and San Juan, Puerto Rico, was dropped from 133 dollars to 100 dollars, it became possible to reduce fares to points beyond San Juan by similar amounts. Tourist-rate flights leave New York and Buenos Aires daily and stops are made at San Juan, Port of Spain, Belem, Rio de Janeiro where there is an overnight stop, Sao Paulo, Porto Alegre, Montevideo and Buenos Aires. The journeys are scheduled to take 50 hours.

CONSTELLATION—CESSNA COLLISION

PASSENGERS in the Pan American Constellation which was struck by a single-engined Cessna 195 after taking off from La Guardia on January 30th experienced, apart from a most unnerving occurrence, a miraculous escape. The small private aircraft, whose occupants were all killed, struck the Constellation from above approximately half-way along the fuselage, probably the only point where a collision of this nature could occur without bringing the Constellation down, as would almost certainly have been the case if flight control surfaces, engines or wings had been involved. Whilst no one would wish to restrict further the private pilot there can be no doubt that strict enforcement of the regulations governing the activities of light aircraft in the vicinity of major airports is necessary in the interests of the safety of airline passengers. The necessity of forbidding pilots of light aircraft to approach large civil airports becomes all the more vital if the possibility is considered that such an aircraft might, if in collision with a machine of the size of the Brabazon, cause the deaths of over a hundred passengers.

A further remarkable feature of this collision besides the fact that the Constellation landed safely was that, although the front portion of the Cessna lodged in the top of the Constellation fuselage, none of the airliner's occupants was injured.

AIRFIELD EMERGENCY ELECTRICAL SUPPLY

EMERGENCY electrical generating plant that can be brought into service instantly and automatically in the event of a failure of mains electricity at an airfield control tower has been engaging the attention of International Aeradio, Ltd. Such a failure of the mains supply could be a very serious matter leading as it would to the cessation of radio and airfield lighting services. To reduce the dangers of such an emergency experiments have been carried out on a Lister Metrovick 200 kva diesel-powered electrical generating plant at Bovingdon and these experiments have proved very satisfactory. In the event of a failure of the mains power supply the emergency generating set is automatically started by means of a Plessey cartridge starter and it has been found that during six months of experimentation, the emergency set has invariably come into full operation in less than seven seconds.

Should a mains failure occur a contactor drops out of circuit and fires the cartridge starter. When the emergency diesel generating set has reached correct speed and voltage another contactor cuts in to distribute the power. If the emergency plant fails to start instantly at the first attempt a second cartridge is automatically fired after a period of about ten seconds and should this also fail, audible and visual warning is given that the plant has not started. Upon the restoration of the mains supply the auxiliary plant is kept running for a period of about one minute (in case of a further momentary failure) and after this period the emergency generator is shut down and the cartridge starter re-set for a subsequent emergency.

CHARTER ACCIDENT AT CASTEL BENITO

IN the early hours of February 4th a Skymaster belonging to Skyways Ltd., flying on a War Office charter from Nairobi to London, crashed at Castel Benito killing the pilot, Capt. R. W. G. Kitley, but causing no serious injury to any of the passengers. It appears that the Skymaster was joining the circuit at the airfield and was flying at the time in the dark and in heavy rain; both flaps and undercarriage were in the "up" position. After colliding with the tops of some trees the Skymaster came down on rising ground. Capt. Kitley was one of Skyway's most experienced pilots and had flown over 1,000 hours in the Castel Benito area when serving with Transport Command, R.A.F.

CHANNEL ISLANDS SUMMER SERVICES

INCREASED services to the Channel Islands during the summer have been announced by B.E.A. Last summer it was found that week-end traffic was particularly heavy and the new schedules show increased services at the week-ends. On the London to Jersey route the Dakota services increase from 4 return flights a day from Monday to Friday and 5 on Saturday and Sunday during May, to 5 return services a day from

Civil Aviation News . . . . .

Tuesday to Friday and 7 from Friday to Monday during July and August. From September onwards the service will be gradually reduced until the normal winter schedules come into operation. During the same time the direct London to Guernsey Dakota service will be increased from one daily return trip to two return services from Monday to Friday and three on Saturday and Sunday. This will be in addition to the early morning mail and newspaper flights. Similar increases will be made on the services from Southampton. From June 11th the weekly service between Jersey and Rennes will be replaced by a twice daily service between Jersey and Dinard.

U.S. SAFETY AWARDS

AMERICAN OVERSEAS AIRLINES, the company which gained the U.S. National Safety Council's Award for safe air transportation in 1947, has completed its second consecutive year without fatal accident. Since October, 1946, the airline has flown across the Atlantic 4,200 times and passengers carried during this period have totalled 149,000. American Airlines, the parent company of A.O.A., has also completed two consecutive years without fatality and since March, 1946, has flown 22 per cent of the total passenger-miles operated by the entire U.S. domestic airline industry. During 1948 American Airlines' figures show a considerable increase in cargo ton-miles compared with 1947. The figures last year amounted to 36,939,000 ton-miles compared with 24,878,000 in 1947.

Pan American-Grace Airways has won the Aviation Award of the Inter-American Safety Council for the fifth year in succession. During this five-year period Panagra have logged 30,649,475 flight-miles without a single accident or fatality to passengers or crew. The passenger-miles figure during the same period amounts to 465,653,951 operating over a route mileage of 9,896 miles. Last year Panagra flew over 6,000,000 miles.

BREVITIES

ACCORDING to financial figures since 1946 the progress made by Air France should enable the airline to pay its way this year. In 1946 receipts totalled 75 per cent of expenditure, in 1947 85 per cent and although complete figures for 1948 are not yet available it is expected that the balance sheet will show receipts totalling 95 per cent of expenditure.

* * *

Following discussions between the M.C.A., the Welsh Advisory Council for Civil Aviation and B.E.A., it has been announced that an experimental service linking north and south Wales will be flown during the summer months. Operated by B.E.A. with D.H. Rapides, the service will commence on April 11th and the route will, on Mondays, Wednesdays and Fridays, be Liverpool-Hawarden-Cardiff-Hawarden-Valley, while on Tuesdays, Thursdays and Saturdays the reverse route—Valley - Hawarden - Cardiff - Hawarden - Liverpool, will be flown.

* * *

Work on two new runways at Ringway Airport, Manchester, is to start shortly and the cost is estimated to be over £1,000,000. One of the runways is to be 5,000ft long running

British Airways' Operating Statistics for October, 1948

MINISTRY of Civil Aviation statistics for October, 1948, show that with the introduction of winter schedules the number of passengers carried by British European Airways during the month dropped to 50,887 from the September figure of 77,362 and the route mileage flown dropped from 15,372 miles in September to 14,123 miles in October. A slight drop is shown by the B.O.A.C. figures but B.S.A.A. carried 1,707 passengers, the highest figure yet recorded. During October, 1948, B.O.A.C. flew 2,379,817 aircraft miles compared with 2,207,495 miles in October, 1947; B.E.A. flew 1,068,490 aircraft miles compared with 1,012,198 miles in October, 1947, and B.S.A.A. showed an increase of 11.4 per cent by flying 453,721 aircraft miles compared with 407,242 aircraft miles during October, 1947. The total number of aircraft miles flown by the three Corporations showed an increase of 7.6 per cent over the October, 1947, figure. The greatest increase was shown by B.E.A. who flew 106,436 mail ton-miles in October, 1948, compared with 43,575 mail ton-miles in October, 1947, an increase of 144.3 per cent. Figures for October, 1947, are as shown in brackets.

	B.E.A. All Divisions	B.E.A. British Division	B.E.A. Continental Division	B.O.A.C. All Divisions	B.O.A.C. Western Division	B.O.A.C. Eastern Division	B.S.A.A.
Passengers carried	50,887 (44,790)	30,665 (30,898)	20,222 (13,892)	11,549 (9,375)	3,519 (2,878)	8,030 (6,497)	1,759 (1,170)
Cargo Carried:							
Mail (tons)	230.3 (122.1)	93.5 (75.8)	136.8 (46.3)	140.4 (145.7)	26.7 (24.2)	113.7 (121.5)	17.7 (13.2)
Freight (tons)	492.1 (280.5)	106.3 (84.7)	385.8 (195.8)	271.7 (180.5)	51.4 (25.9)	220.3 (154.6)	43.0 (50.0)
Average Load:							
Passengers (No.)	14.4 (11.9)	12.4 (8.5)	15.7 (16.5)	15.2 (12.1)	26.0 (25.0)	13.7 (10.1)	11.3 (10.3)
Total (lbs)	3,179 (2,517)	2,389 (1,601)	3,652 (3,625)	4,375 (3,784)	5,462 (6,280)	4,183 (3,403)	4,227 (4,061)
Average Capacity:							
Seats (No.)...	20.0 (16.2)	16.9 (12.2)	22.2 (21.7)	23.4 (18.8)	43.4 (43.2)	20.6 (15.1)	19.8 (19.1)
Total (lbs)	4,531 (3,732)	3,579 (2,772)	5,101 (4,895)	7,217 (5,786)	9,936 (11,479)	6,739 (4,918)	7,294 (6,948)
Average Length of Haul:							
Passenger	283 (259)	167 (155)	453 (491)	2,994 (3,012)	2,221 (2,684)	3,299 (3,159)	3,005 (3,718)
Mail	462 (357)	168 (138)	663 (716)	4,483 (4,076)	3,455 (3,500)	4,724 (4,190)	5,664 (5,643)
Freight	456 (485)	191 (152)	529 (629)	3,462 (3,419)	2,949 (3,048)	3,582 (3,481)	5,606 (5,349)
Hours flown:							
Revenue: passenger services ...	6,938 (7,167)	3,430 (4,695)	3,508 (2,472)	11,635 (11,818)	1,091 (1,293)	10,544 (10,525)	2,239 (2,284)
cargo services	579 (341)	— —	579 (341)	1,254 —	494 —	760 —	— —
charter and special flights	116 (284)	110 (69)	6 (215)	22 (1,172)	— —	22 (1,172)	303 —
Non-revenue	173 (246)	79 (160)	94 (86)	1,298 (1,932)	328 (712)	970 (1,220)	261 (150)
Equivalent annual utilization (revenue hours flown) per aircraft ...	1,222 (1,072)	1,024 (1,059)	1,474 (1,095)	1,358 (1,428)	— —	— —	1,360 (1,672)
Unduplicated route miles in operation at end of period	14,123 (13,907)	3,854 (4,872)	10,269 (9,035)	66,395 (56,785)	8,523 (7,748)	57,872 (49,037)	24,375 (23,168)
Percentage regularity	97.2 (98.1)	97.0 (97.9)	97.6 (98.6)	99.9 (97.6)	100.0 (100.0)	99.9 (97.3)	100.0 (99.1)
Average length of stage flights (miles)	193 (159)	112 (111)	383 (382)	971 (903)	1,095 (1,249)	952 (866)	1,096 (1,265)

N.W. to S.E. and the other will be 5,900ft running from N.E. to S.W., and it is hoped that they will be ready for use during this year. The new terminal buildings which were opened by Lord Pakenham on February 7th include waiting rooms, offices, a bar, restaurant, and traffic hall.

* * *

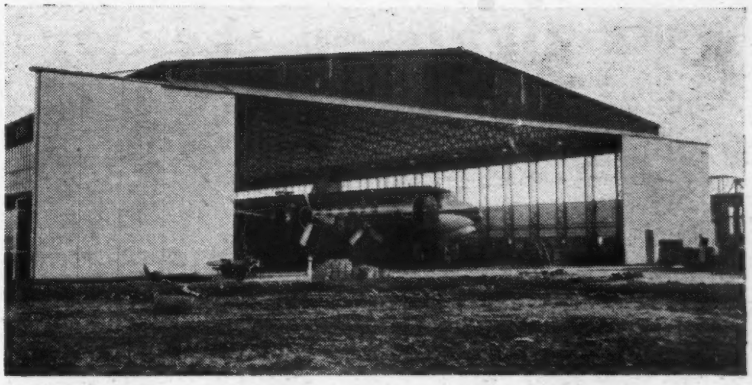
Representatives of ten airlines met at the Conference of the International Air Transport Association in Brussels on January 31st, to discuss the introduction of a tourist rate in transatlantic fares. The airlines were from Great Britain, America, Holland, France, Belgium, Canada and the Scandinavian countries, and the Conference, presided over by Sir William Hildred, the Director-General of I.A.T.A., was expected to last for several days.

* * *

Provisional traffic figures for British South American Airways during 1948 show a considerable increase over the figures for 1947. The total aircraft miles flown during 1948 were 5,173,478, a 26 per cent increase over the 1947 figure of 4,100,400; the number of passengers increased 38 per cent from 12,640 in 1947 to 17,510 in 1948. The Corporation carried 753 tons of mail and freight during the year, an increase of 16 per cent over the 1947 figure of 646 tons, and the traffic ton-miles increased from 7,098,357 in 1947 to 8,032,663 in 1948. The route mileage in operation at December 31st, 1948, was 21,011 miles, an increase of nearly 1,000 miles.

* * *

During the first six months of the operation of the service from London to Bombay by Air-India International, Ltd., 3,080 passengers, nearly 40 tons of freight, and 37 tons of mail were carried, at a regularity of service of 98 per cent. The Air-India International fleet consists of three Lockheed Constellations, and delivery of two more is expected later this year.



RESURRECTION: K.L.M. have re-erected two wartime R.A.F. hangars from Benbecula Island in the Outer Hebrides as one large hangar on the south corner of Schiphol Airport. The new hangar is named "Hebrides" and is 220ft long by 115ft wide and is capable of taking three DC-6s.

The new Constellations will have an all-up weight of 105,000 lb, and the aircraft at present in service will later be modified to bring them to this higher all-up weight.

* * *

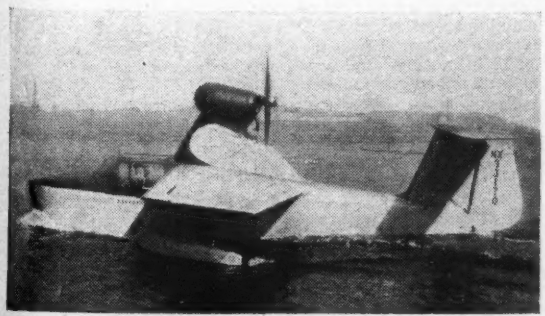
Lord Pakenham, the Minister of Civil Aviation, opened an exhibition of aerial survey work on February 8th at the Alpine Club. The exhibition, "The World from the Air," which was organized by Hunting Aerosurveys, Ltd., and closed on February 9th, showed the various uses of aerial photography and survey in the different branches of industry and science. In addition to aerial views taken all over the world there were sections dealing with forestry, agriculture, archæology, architecture and town planning. Cameras, surveying instruments and plotting equipment were also shown, together with models made from air photographs, and a section showing the usefulness of air photography as a visual aid to education.

FROM THE CLUBS

ON January 23rd the Darlington and District Aero Club was visited by Mr. D. De La Hoyde, of the Royal Aero Club, after which quite a number of members decided to attend the Deauville air rally. Members have taken full advantage of the recent fine weather and flying hours are high for the time of year. Recently Mrs. Haw achieved the distinction of being the first woman member of the Club to go solo. The bi-weekly film shows and dances have proved very popular and will be continued throughout the dark evenings. Visitors by air will be welcome at the Club and limited accommodation can be arranged.

* * *

ALTHOUGH Christmas festivities to some extent overshadowed flying during December at the West Riding Aviation Centre, 16 dual and 18 hours solo were flown during the month. Mr. Hodgson, the Club's Air League Scholarship holder, successfully passed his "A" Licence test. It is understood that he is shortly to join the R.A.F. On December 16th the Skal Club, whose membership is drawn from leading travel agencies in Leeds and Bradford, made a tour of the airfield and took lunch in the restaurant. The function was attended by the Lord Mayors of Leeds and Bradford and other guests including leading personalities of the transport world, B.E.A. and representatives of the B.B.C. On December 28th Captain Middleton gave a lecture on the Berlin airlift which proved of considerable interest to those attending. During December two new flying members and eight new ground members joined the Centre, bringing the total membership up to 422. One new member, well known in the wrestling world, is Mr. Relwyskow, who, the Club states, turned the office scales at 18½ st. The Club is understood to be feeling a little apprehensive for its Austers!



SPORTSMAN: This new light three-seater amphibian has been designed and built by K.C. Bunyard, of New York. Of wooden construction, it is powered by a 130 h.p. Franklin engine, giving a cruising speed of 110 m.p.h., and has a tricycle undercarriage. Mass production of a slightly larger four-seater model is being contemplated.

* * *

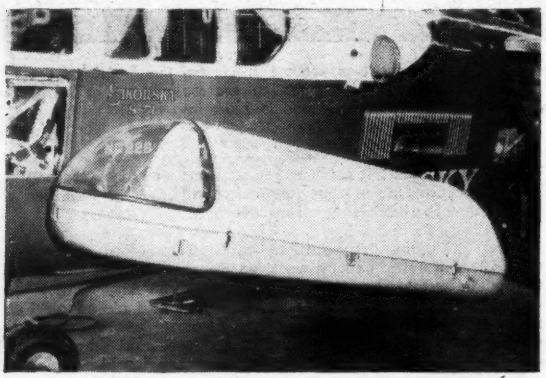
THE Midland Aero Club held their annual general meeting at Elmdon Airport on January 27th, at which a large number of members were present. Officers elected for the forthcoming year are Mr. W. H. Sutcliffe, president; Mr. D. S. Scoffham, D.F.C., secretary; and Mr. T. C. Pepper, honorary treasurer. Eleven names were put forward for election to the council, and a ballot was held to select members to fill the six vacancies. The result of this ballot was that the following were elected to the council: Mr. H. Everitt, Mr. H. Glover, Mr. N. Harper, Mr. P. F. Hemming, Mr. J. Hollander, Mr. J. K. Wood. In his report the chairman stated that the number of members as at March 31st, 1948, was 380 and the membership at the moment stood at 409. During this year 14 social functions had been organized which included such diverse functions as a flying meeting, Guy Fawkes Night, and a children's party. Speaking of the future, it was stated that the Club hoped to organize an air display open to the general public on Saturday, June 25th, if the Ministry of Civil Aviation would grant permission for Elmdon Airport to be used for this purpose. It was stated that the Club had ambitious plans for the future, but was severely handicapped by the financial position and heavy overheads. Monthly parties were continuing to be most enjoyable and successful functions.

Sidelights on the Air Ambulance

A New Type and a Wartime Adaptation

FOLLOWING our description (*Flight*, January 27th) of the air ambulance demonstration held at Brize Norton on January 20th, during which various light aircraft were shown adapted for stretcher-carrying, we have learned that the versatile D.H. Tiger Moth was, during the war, converted for casualty evacuation—by the R.A.F.'s Research and Development Unit at Cawnpore, India. A former member of the Unit, ex-F/O. E. A. Watson, has sent the accompanying photograph, showing the method of conversion. The rear seat was removed and a stretcher fitted to the top longeron; the patient was protected during flight by the replaced rear fuselage fairing.

Many observers at Brize Norton who witnessed the performance of the Sikorsky Hoverfly 2 with an external, uncovered stretcher fitted, suggested that this rather breezy mode of travel might have unwelcome effects on the exposed patient. Their apprehension should be allayed, however, by the assurance that plastic covers will be used to protect casualties as and when helicopters are required for rescue work. The fully protected quickly-detachable litter illustrated is shown fitted to a Sikorsky S.51 helicopter, as built under licence in this country by Westland Aircraft, Ltd.



THE NEW AND THE OLD: On the left is the latest refinement in stretcher carriers—with plastic window—and, on the right, a Tiger Moth as used in India during the war for urgent cases.

A DUAL DISASTER

Two Brilliant Test Pilots Killed

FLIGHT records with regret the death of Mr. R. Lindsay Neale, chief test pilot of Boulton Paul Aircraft Ltd., and Mr. K. P. H. Tisshaw, also a test pilot at Boulton Paul, in an accident to a prototype Balliol T.2 on February 3rd. The machine was being flown from Wolverhampton Airport on one of a series of diving tests by Mr. Lindsay Neale, with Mr. Tisshaw acting as observer. After brief tests from some 14,000ft, the Balliol was seen to be descending at very high speed and crashed in a field about half a mile from the airport, both pilots being instantly killed. The cause of the accident has not yet been determined.

Contrary to early Press reports, the Balliol was a piston-engined version, and was not powered by an Armstrong Siddeley Mamba turboprop.

Each of the pilots leaves a widow and two young children. The funeral service was a joint one at Codsall Church yesterday.

The following appreciations have been written by a colleague of the pilots:

Robert Lindsay Neale was born on January 24th, 1912, and educated at Caterham. His early business training was with the aviation department of Selfridges and with Brian Lewis & Co. Ltd. at Heston. He learnt to fly at Croydon in 1931 and, after a short period of association with Chamier, Gilbert Lodge & Co. in 1935, set up his own aviation consultant's business in London, under the style of Lindsay-Neale Aviation Limited, of which he was Managing Director from 1935 until 1940. During this period he was also a director and test pilot of Dart Aircraft Ltd. On the outbreak of war he joined the R.A.F., from which he was released at the end of 1939 for test flying with Boulton Paul Aircraft Ltd., becoming their chief test pilot in 1945. He was an Associate of the Royal Aeronautical Society and a member of the Royal Aero Club.

As a flyer, Lindsay Neale was in tune with his element in all its moods. As a test pilot he was outstanding. Completely fearless and quick of decision in emergency, he brought to his task a cool detachment from the purely mechanical business of flying that enabled him to exercise his keen powers of observation and to draw sound conclusions from what he found. In this his wide experience of aircraft of all types stood him in good stead.

Always serious in discussing his official business, "Robin" was a light-hearted companion in his leisure hours. He retained a boyish sense of fun—almost frivolity—and a tireless good humour which made him a welcome and noteworthy addition to any company. His many friends in the industry and in the Service will deeply regret his passing.

Kingsley Peter Henry Tisshaw was born at Putney on September 25th, 1923, and received his education at St. Paul's School and at Aberdeen University. He joined the R.A.F. in 1941 and, after training in the U.S.A., served as a flying instructor at a number of R.A.F. home stations. He married in 1945 and in December of that year was posted to Turkey, returning to this country in January, 1947. Two months later he left the R.A.F. and took his "B" Licence and Second Navigator's Licence with Straight Aviation Training Ltd. before joining Boulton Paul in August, 1947.

Peter Tisshaw belonged to a generation of "up and coming" young test pilots, and his skill in flying and reliability of judgment had already commanded the respect of his colleagues. Quiet in manner and very likeable in disposition, he was happiest when in the air. Those who saw his precise and polished demonstration of the Balliol 2 at Farnborough last September will have appreciated the complete understanding between man and machine that he had achieved.

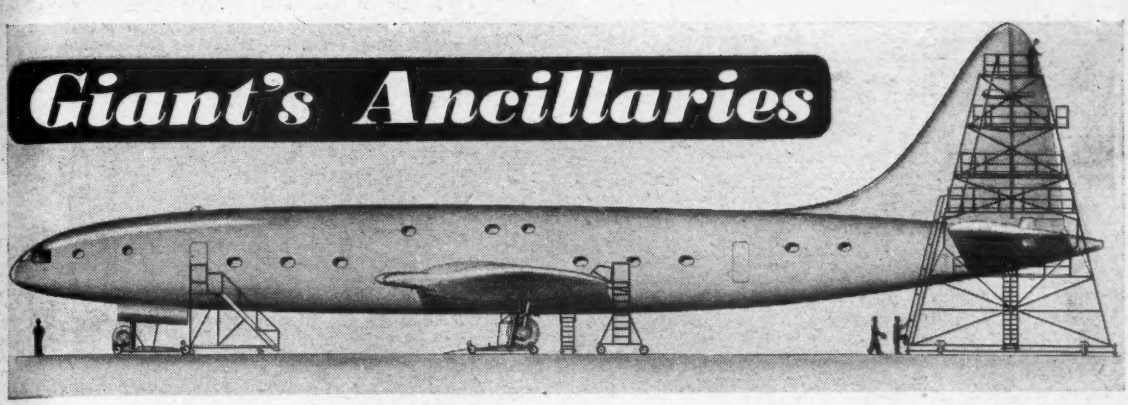
The industry can ill afford the loss of men of his calibre, and all who knew him will extend their deepest sympathy to his wife and family and to his parents in this tragic curtailment of a career full of promise.

W. J. P.

CONTINENTAL CAR FERRY

FOLLOWING the announcement (*Flight*, January 6th) that the Ministry of Civil Aviation had issued a licence to operate a motor car ferry service on a scheduled basis between Lympne and Le Touquet, it is now confirmed that Silver City Airways will begin these flights on April 14th using Bristol Freighter aircraft. The schedule provides for four services a day in each direction. The single fares to be charged are £28 for cars up to 12 h.p., including four passengers and luggage, and for cars above 12 h.p. the charge will be £32.

Giant's Ancillaries



Ground Equipment for the Brabazon : Slinging Gear, Servicing Platforms and Trolleys

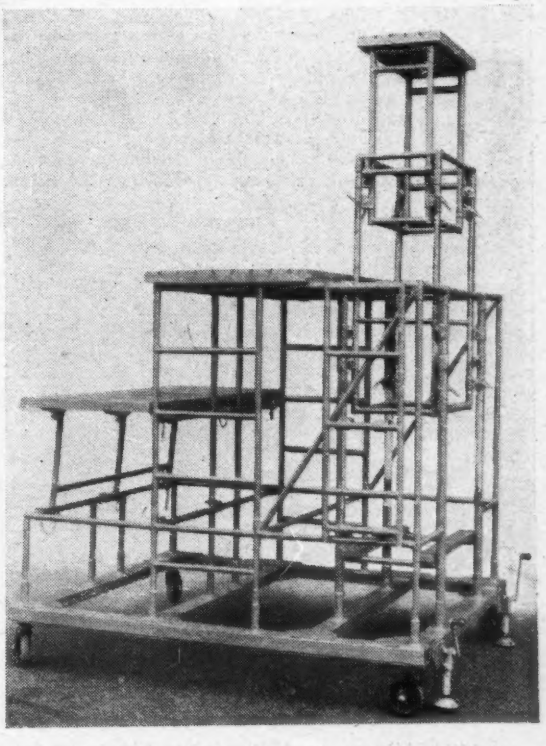
MUCH has been written about the Bristol Brabazon airliner which is now nearing completion at Filton. Mr. A. E. Russell, the chief designer, has outlined some of the design difficulties and problems, aerodynamic and structural, in a paper before the Royal Aeronautical Society. The very detailed calculations made, and the quite exceptional care taken in exercising the most rigid weight control, have resulted in the machine being within a few pounds of the estimated weight, an achievement which must be almost without parallel in the history of aviation.

Facts such as these may tend to disguise the magnitude of the task of building such a huge aircraft, and even the statement that the wing span is 230ft, the length 177ft, the wing area 5,317 sq ft, and the gross weight about 300,000lb fails to convey any real basis on which to form a mental picture. Standing near the machine and looking up at its towering mass does give one a feeling almost of awe, but so beautifully is it proportioned that one takes for granted the large engine units and the huge control surfaces, even the undercarriage which supports the whole great structure. They are so much "to scale" that one is apt to overlook the fact that they had to be placed in position.

Control-surface Design

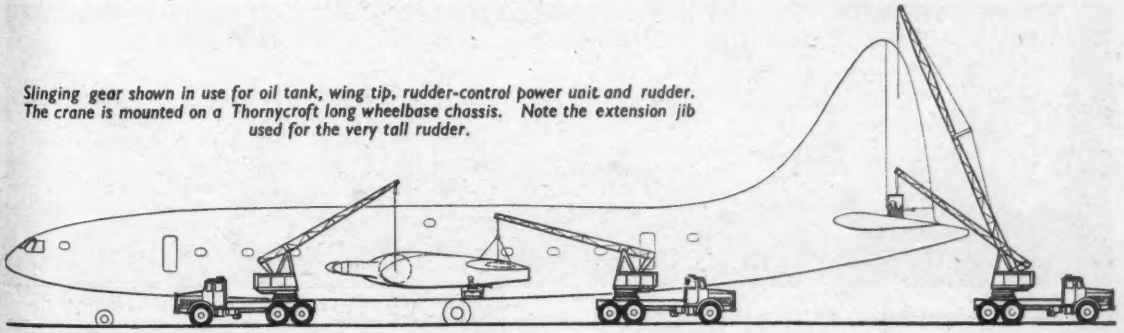
Knowing that Folland Aircraft, Ltd., had done a good deal of work on Brabazon control surfaces, we visited the factory at Hamble to find out more about it. We found that there was much more involved than we had thought. Not only did Folland Aircraft do the detail design of rudder, elevators, ailerons and flaps (under the control of the Bristol Aeroplane Company, so that full particulars are on the type schedule), but also built and delivered them. The firm is, of course, approved for design.

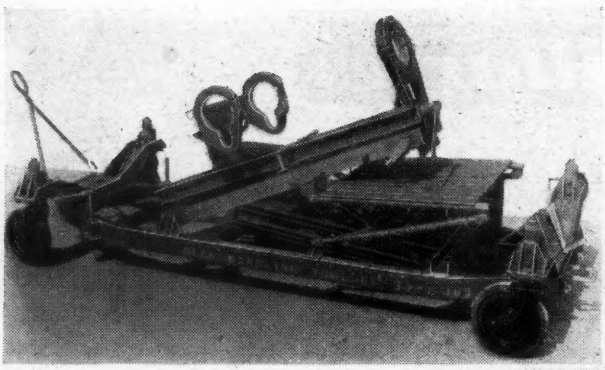
The story does not, however, end there. When such large control surfaces are finished there still remains the problem of storing them, transporting them to the aircraft



The engine servicing platform (telescopic) is typical of many used for the Brabazon.

Slinging gear shown in use for oil tank, wing tip, rudder-control power unit and rudder. The crane is mounted on a Thornycroft long wheelbase chassis. Note the extension jib used for the very tall rudder.



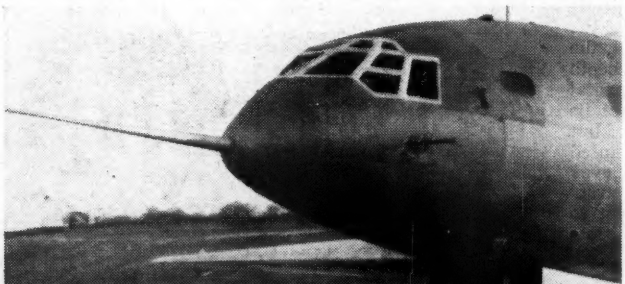


(Left) The handling trolley for the oleo legs in its transport position. (Below) The trolley in position for attaching the leg to the airframe. Very accurate positioning was necessary involving angular and relational control.

Giant's Ancillaries . . . . .

and fitting them in place. Although large in area, and fairly solid-looking objects, these control surfaces are fragile when it comes to handling, and cannot be picked up just anywhere without risk of damage. There is the question of suitable slinging points, mostly confined to the hinges of the surfaces. And although initial assembly was done in the hangar at Filton, provision had to be made for servicing, and even possibly replacement, in the open when away from base. This might mean winds strong enough to make handling difficult, with consequent chance of damage.

In watching the finished Brabazon such considerations are not immediately obvious to the onlooker, but mention of some of the ground equipment designed and manufactured by Folland Aircraft will serve to indicate the scope of the work. Transport trolleys for undercarriage gear, outer wing, rudder, elevators, ailerons and flaps. Slinging gear for wings, flaps, ailerons, elevators and rudder. Slings for aileron and elevator power units; towing gear; servicing platforms for airscrews, engines and control surfaces; wing and tail steadies, and sundry tools and trestles. This does not exhaust the list, but covers the main items.

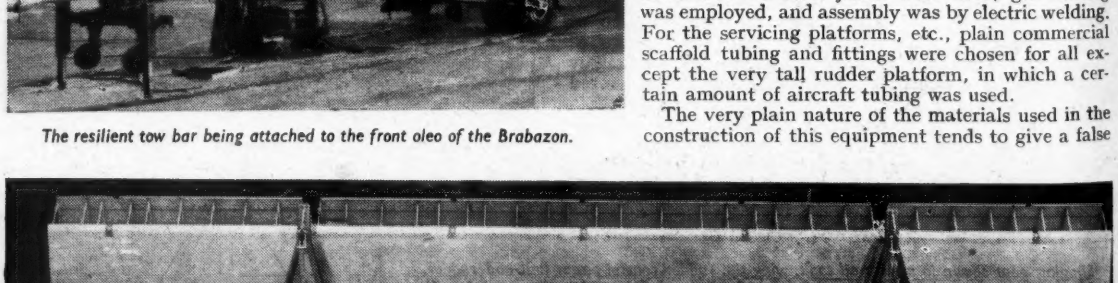


The resilient tow bar being attached to the front oleo of the Brabazon.

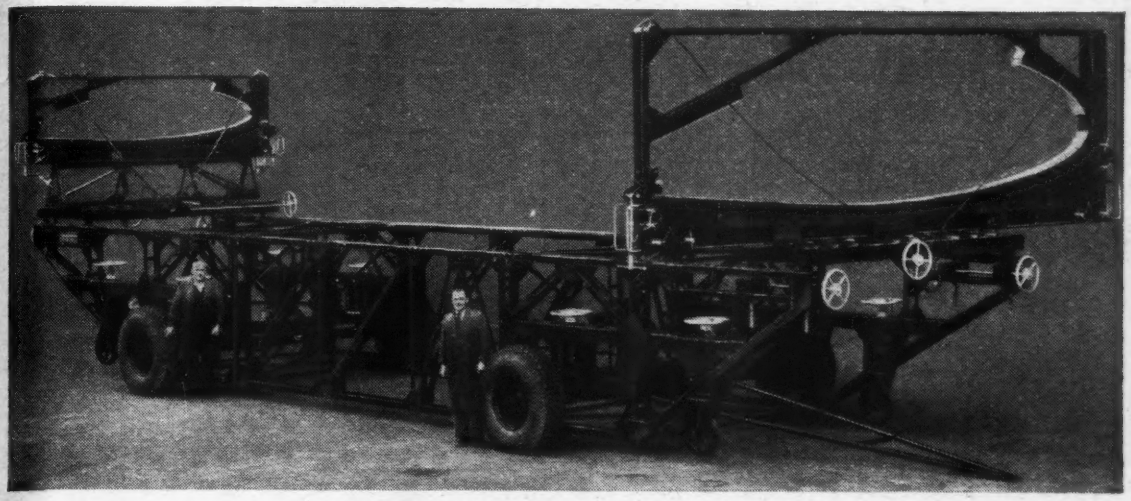
Studied Simplicity

The requirements for this equipment were laid down by Bristols, B.O.A.C. and the Ministry of Supply, and Folland Aircraft prepared schemes for approval before starting design and manufacture. Bearing in mind that much of this equipment might have to be duplicated overseas when the Brabazon goes into service, simplicity and ease of manufacture were basic considerations. In the case of the framework of the various trolleys, for instance, commercial rolled steel joints were used, gas cutting was employed, and assembly was by electric welding. For the servicing platforms, etc., plain commercial scaffold tubing and fittings were chosen for all except the very tall rudder platform, in which a certain amount of aircraft tubing was used.

The very plain nature of the materials used in the construction of this equipment tends to give a false



An inner wing flap in its cradle for transport and stowage.



The transporter trolley for the outer wings had to be capable of holding the wings in exact alignment while they were being bolted and riveted to the inner wings.

Giant's Ancillaries . . . . .

impression of simplicity and ease of design. Actually there were a good many intricate problems to be solved, due to the fact that it was, for example, not merely a case of slinging a control surface to the approximate height and then guiding it by manhandling into the right position for bolting up. The surfaces had to be held accurately in position by the mechanical gear.

In other respects, too, great precautions had to be taken. In the case of the transporter trolley for the outer wings, for instance, provision had to be made not only for accurate location but for rigidity. This was made necessary by the fact that the outer wing portions had to be brought into position against, and lined-up with, the inner wings and there held firmly while the two wing portions were bolted and riveted together. This entailed several multi-directional controls on the trolley.

Or take the case of the oleo legs. A very special handling trolley had to be provided for attaching them to the wing, since the leg had to be wheeled into position in a sloping attitude and then brought to the vertical. Fine adjustment was required not only for vertical and lateral angle, but the leg had to be capable of being rotated about its axis so as to bring bolt holes, etc., into accurate alignment.

Even an apparently simple piece of equipment such as the tow bar presented special problems. Resilient towing from the front undercarriage leg was easy enough, but provision had to be made for the aircraft over-running the tractor. This could cause damage to the oleo leg, and was guarded against by a weak link. Switches had to be incorporated so as to give a light warning to the driver of the truck if he was beginning to take his turns too sharply.

Many other instances could be mentioned of problems to be solved, but sufficient has probably been said to indicate that the design of this ground equipment for the Brabazon was not quite as easy and simple as one might imagine.

Folland Aircraft is doing other work. Under sub contract from the de Havilland Aircraft Co., Ltd., many parts of the Dove airframe structure are being made, as well as wings for the Vampire, and a number of tools for Chipmunk manufacture.

One of the most interesting jobs now being tackled is the conversion of a Bristol Brigand for deck-landing developments. No aircraft heavy enough to test new carrier equipment, and designed for such work, was in existence, and Folland Aircraft was given the task of converting a Brigand. Since the machine was not originally stressed for such work, Mr. A. Beavan, Folland's chief designer, and his staff had to re-stress the whole structure. Catapult and arrester gear impose loads on the aircraft structure which do not arise in ordinary land-based operations. Fortunately, as the Brigand is not intended for actual carrier work, but solely for testing carrier equipment, the weight question is not serious, and in many circumstances it has been possible to strengthen the structure by merely using a heavier gauge of skin sheeting, a fact which makes the strengthening process much simpler.

SWISS-BUILT VAMPIRES

THE Swiss authorities and the de Havilland Aircraft and Engine Companies in England have concluded a contract whereby, following the supply of a large number of Vampires from England, aircraft of this type will be manufactured under licence in Switzerland, thus increasing overall output.

Following Swiss experience with Vampire 1s has been evolved the Vampire Mk. 6, closely resembling the Mk. 5 as supplied to the Royal Air Force, but powered by a Goblin 3 turbojet of 3,300 lb static thrust. (The Mk. 5 has the Goblin 2 of 3,000 lb). Increased thrust is especially valuable in Switzerland, where short take-off runs with full war load are constantly demanded. Deliveries to Switzerland of the first of 75 Vampire 6s are now starting.

It was recently announced in Berne that a hundred Vampires will be built initially in the Swiss factories, though, as is usual under licence agreements, a certain number of components and various materials will be supplied from England in the early stages of the project. The Goblins will all be built by the de Havilland Engine Company.

A de Havilland statement points out that to take on the manufacture of a modern aircraft under the technical guidance of the designing company is a project involving several years of co-operative international effort and organization. The choice of the Vampire by many countries which occupy key positions in world affairs, it is affirmed, may be taken as an indication that the Vampire design, from the point of view of the airframe and the power plant, will be vigorously developed, for such elaborate preparation would be unwise unless there was confidence that the type would hold a pre-eminent position among the world's fighters of the new generation.

No precise information on forthcoming Vampire developments may yet be divulged.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

JET PROPULSION

Another Layman's Explanation

MAY another layman (re *Flight*, January 20th) offer an explanation which he knows that others have found helpful?

If one sat on truly frictionless ice and threw one's hat away, one would travel in the direction opposite to the hat's path, and at a speed depending on (a) one's own mass; (b) one's hat's mass; and (c) the speed at which the hat left the hand. (Try standing on ice and putting the weight from a standing put—preferably on to the bank and not on to one's own ice!)

All a jet does is (i) to manufacture "hats" by taking in masses of air, and (ii) by using energy obtained from the combustion of fuel, to "throw them away" at a sufficient speed. The speed and direction of "throw-away" give the aircraft velocity. Change of the directional feature of the velocity is not done by jet principles but by what is really a form of braking—sticking rudders, etc., out into the air and creating a lopsidedness ("couple") of resistance forceful enough to upset the direction produced by the "throw-away."

No doubt there is in practice a slight "punt pole" effect from the "shove" of the jet against the air; but it is unsought and not relied upon. One could not fly in a vacuum because there would be no matter on which to be airborne; but one could jet upwards therein if one had the material (e.g., as in a rocket).

The word *jet* is derived from the Latin *jactare*, which is the frequentative of *jacere*, to throw; so jet engine, jet drive, etc., are surely *les mots justes*. (Was Mr. Hollis in the N.F.S.?)

London, S.W.1. J. E. T. TYDYNE.

R.A.F. MORALE

"It's Tommy This, and Tommy That . . ."

MANY articles have been written recently on the subject of the post-war R.A.F. May I, as an aircrew N.C.O. serving on "Operation Plainfare," attempt to show the present peacetime Air Force as seen through the eyes of the average N.C.O. aircrew member? All the points I raise are not my own, although I am in entire agreement with them. They are topics of discussion in the messes of every flying unit in the R.A.F.

During the war, we were the "gen-kids." When we went up, so did Jerry's cities and factories. Down went his fighters and V-bombs. We supplied Wingate's Chindits, drove the *Luftwaffe* from Africa, sank U-boats, and dropped paratroops. In general, we did the job for which we were trained. And we did it well! Nothing was too good for the boys; give 'em egg and bacon for breakfast, milk, extra leave. Yes sir, we were the "gen-kiddies," the blue-eyed boys, and we loved it. We were keen.

Then the war ended. For many of us, redundancy. Gone were our Warrant badges and our crowns. Our days of glory were over. "You know that b—— aircrew bod. who drives the salvage gharry?" We drooped and wilted. Our brevets were out of place behind Orderly Room desks and driving wheels. Roll on Group 40 was the cry!

Suddenly we pricked up our ears. What's that; sign on for three years under the new scheme, and fly again? Wizard, always was keen on flying; must have a basinful of that. And so we took to the air again, and our spirits soared with us. Then came the blow. "Take down your Warrant badges, crowns and stripes. Wear these." We did and still do, and people ask each other, "What is it, an advert. for Martell brandy, one of the Pirates of Penzance, or the Lone Star Ranger?" In the Y.M.C.A. we don't want to eavesdrop, but we can't help overhearing the conversation between two erks: "But do we call 'em sir, sergeant or shag?" "Don't know, Joe, best ignore 'em." Once again we wilt and are desolate. Our newly awakened pride takes a beating. We are nobody's baby. Just b—— aircrew, the laughing-stock of a Service which exists only to keep us airborne. New methods of victimizing us are concocted on every station. Here is an example.

An all-N.C.O. Dakota crew returns to its base after a three-day trip with passengers and mail down the Persian Gulf. A night's sleep, and the following night, guard duty. A man who, just 24 hours previously, was entrusted with men's lives, large quantities of H.M. Royal Mail, to say nothing of a valuable aircraft, isn't trusted as Guard Commander, which any sergeant or corporal can do. Oh no, he's actually sent on sentry-go, like an A.C.2. You don't believe it ever happened? Contact a certain airfield in the Canal Zone, and you'll find it was happening in 1948, and the aircrew doing guard duty at night were engaged in the evacuation of Palestine during the day. I'm pleased to say that aircrew guard duties have stopped now, but it happened! That is only one instance of the treatment meted out to us by an unsympathetic Service. Wherever we served, in U.K., M.E.D.M.E., or the Far East, our privileges disappeared one by one. It was done in the usual subtle manner, so that we couldn't kick. "Exigencies of the Service, old man." If a routine trip comes up, send P2 Smith and crew. If it's a much-coveted night stop in Brussels, let F/L. Brown go. So once again we sweat on demob.

Then comes the Berlin blockade. Much praise. We feed and fuel Berlin from Wunsdorf, Fassberg, and are finally settled at Lübeck. We are visited by Mr. Arthur Henderson, Marshal of the R.A.F. Lord Tedder, and many high-ranking officers. By newspapermen, B.B.C. correspondents and newsreel cameramen. We are praised and congratulated. We are granted extra cigarette rations, and special leave camps in Germany. Once again we are the "gen-kiddies," the blue-eyed boys. And we respond. We throw out our chests and mix as equals with our fellow-men. We are needed, we who have been kicked and neglected since 1945. Our morale is 100 per cent again. "Operation Plainfare," while tiring us physically, has made new men of us mentally. It has given a much-needed boost to our dwindling self-respect and prestige.

But what will happen when the airlift finishes? Shall we still be treated as men of great moment, or shall we revert to our normal status of "only b—— aircrew"? You may think that that depends on us, but it doesn't, because unfortunately the Service has a short memory. Let the Air Force change its policy, give us three stripes instead of three stars, then leave the rest to us. That is the general attitude of N.C.O. aircrew to-day.

As for myself, I like flying and am still proud of the Service and its traditions, but until it learns to treat its aircrews as men all the time, instead of as recalcitrant schoolboys most of the time and men in emergency only, all I can say is, roll on December and demob. Ever heard of the North-country maypole ditty which goes:—

I'm a collier by my trade,
I can use a pick and spade,
I can wheel a little barrow up a brew.

Well, I would be happier with that as my theme-song than wasting the best years of my manhood on an unappreciative Service which makes vague promises it can't (or won't) fulfil. Even when it makes a "definite" promise, there is always a loophole through which it can retire, leaving us to hold the baby. So wake up, R.A.F.,,and give us the square deal we've always given you. Then once again we can live up to our reputation as the finest Air Force this world has ever seen.

R.A.F., Lübeck. "J'Y SUIS, J'Y RESTE."

The Broken Chain of Command

IN reading so much of present conditions as the main cause of lowered morale in the R.A.F., may I also remind readers of those disruptive factors in our air force which are inherent structural flaws whereby the R.A.F. has sacrificed ethical considerations in order to secure improved technical development?

The aircraft tradesman has never fully accepted the necessity for any form of military law because he regards this as inappropriate to his non-combatant technical status. In this aspect of R.A.F. life the greatest need has always been for officers who themselves fully understand the principles of military life and are capable of interpreting them, with particular R.A.F. applications, to the airmen under their command.

The airman not only lacks the personal danger which can make the foot soldier and seaman gunner embrace discipline in order to increase the chances of survival in their perilous callings; he also lacks the compensation of a personal officer whose willingness to share the most dangerous post, and attend to the needs of a certain number of men, can make acceptable the idea of the King's Commission.

Certain corps in the Army are also composed of men whose

Correspondence . . . . . .

function is not normally combatant, but the Army never allows any soldier to forget that he is first a fighting man. In these corps, discipline and regimental pride are as proudly maintained as in the purely fighting units. The R.A.F. has been less able to present the necessity for every man to be, at heart, a fighting man. Moreover, the functions of the airman's life come from separate sources; he has to look to different departments for his work, domestic administration, and his experiences of justice. His loyalty is split by a broken chain of command.

Another result of the broken chain of command has always been that there were a large number of officers with no responsibility for men. Such a situation always makes the other ranks disgruntled, and often induces a cynicism in the beneficiaries by which they do most to bring about the collapse of the structure which gratuitously supports them.

Weymouth, Dorset. R. C. O. LOVELOCK,
Ex-Wing Cmdr.

MANNING THE R.A.F.

Experiences of an Aircrew Trainee

I HAVE been waiting for just such an opportunity as your correspondent R. J. B. now provides with his article "Conscription and the R.A.F." (20/1/49) to give my impressions of life in an already very much criticized organization. I can, perhaps, best do this by providing you with a perfectly candid and truthful record of my own service.

I entered the R.A.F. early in 1945, an ex-university student selected for training in aircrew. At that time prospects of wings and a commission appeared very bright. Young and not yet disillusioned, I, like many others, had been intoxicated by the glamour that the Battle of Britain pilots had already given such a force. That I should never become one of these heroes never entered my head.

Six very interesting months were spent in some preliminary flying-training, after which I was posted to Heaton Park, a station that any aircrew boy can only associate with a complete lack of organization. It was, officially, a holding-unit for aircrew trainees awaiting further courses. While I was there, I met fellows who had been "waiting" for as long as three years for such courses, and who had been drawing good aircrew pay for merely being somewhere in the vicinity and ready in case of posting, a prospect that had been dismissed by many long ago. Some, who lived reasonably near The Park, were only seen on pay days, the pay roll being the only list on which their names appeared. The phrase "couldn't care less" must surely have had its origin at Heaton Park!

In 1946, along with many other lads, I was made redundant. The R.A.F. no longer required our services as flying personnel. But a ground job in such an organization had about as much appeal to me as a road-sweeping job in civilian life! That I eventually became a P.T. instructor, a trade that was held by so many in such awe, was due to my love of sports, a longing for an interesting trade, and a desire to be my own boss. That I became my own boss was, to a certain extent, true, and I settled myself down to a life of complete leisure on a "static" camp in Scotland. P.T. was not even discussed. I sat in a sports store day after day teaching myself shorthand, chess, and how to do crossword puzzles The commanding officer was happy without his P.T., and so was I, and of all the tradesmen on that camp the P.T.I. was the most popular.

I eventually moved to a hospital in Southern England, and, for the first few days, I was a little wary, anxious to resume my inactive life, but careful lest I should discover my real duties on the camp. It appeared that I was there for rehabilitation work, but that the doctors, quite correctly, thought it would not be wise to allow an inexperienced person to exercise their patients. I would, they said, do them more harm than good! I heartily agreed with this assumption and prepared myself for another period of inactivity. But this time my sports store became a "home-university." I fitted up a fireplace and built hidden libraries for my books. And, above all, I constructed a device to warn me of the approach of visitors. I soon perfected a four-day week, the other three being spent at home, and found that, in time, I had no need for the proverbial slip of paper when wandering about the camp. The whole idea of service life had become a fiasco! Demobilization was on the horizon, and to reach it was my only ideal. And when that day arrived, my C.O. who, bless his heart, knew me no better than the next fellow, described me as an airman of very good character, very good conduct and very good trade proficiency.

With such a memory behind me, how could I even begin to criticize the R.A.F.? The situation reminds me of the day I took leave of my commanding officer, and he asked me whether I had enjoyed my stay in the Service. All I could do was to stand and stare and make no reply. I had so much to say but knew not how to say it! "ALLAKEEFIK."

Leamington Spa.

Why Not a "Pools" System

I AM sure J. S. Pole (20/1/49) would appreciate a further suggestion to "toss into the arena."

Why not pick the officers for each day from a hat? This way all personnel would have a sporting chance, and the opportunities for "Pools" to brighten the life of the R.A.F. is obvious. J. BOWER.

London, N.W.11.

THE R.A.F. AS A CAREER

Disillusion Forecast

THE young man who answers the call of those glowing advertisements to "make the R.A.F. your career" is going to be disillusioned.

Having applied himself with diligence to his work in foreign parts on a lower salary than that of a postman, at the end of five years he will find himself bundled out with a venomous confidential report.

Further, he will find that he will then have to return to school to learn a profession, his R.A.F. experience not being required in civil life. Having qualified in some civil trade at the end of a further five or ten years, he will then find that he will be too old for pension employ, as his R.A.F. service will not be deducted from his age.

This former C.O. in the R.A.F. will wish him "the best of luck." G. M. BRETT.

FORTHCOMING EVENTS

Feb. 10th.—Royal Aeronautical Society: The Second Louis Bleriot Lecture: "French Practical Aerodynamic Methods," Monsieur Brocard and Monsieur Hussenot.

Feb. 11th.—Institute of Transport (Chelmsford): "The Future of British Internal Air Services," J. F. Parke.

Feb. 11th.—R.Ae.S. (Portsmouth) Short Papers by members of the Branch.

Feb. 11th.—Guild of Air Pilots and Navigators, and Air League of the British Empire: Ball in aid of the Guild's Benevolent Fund and the Air League's Young Pilots' Fund.

Feb. 12th.—Rugby Football Twickenham, Royal Navy *versus* Royal Air Force.

Feb. 12th.—British Interplanetary Society: "The Design of Liquid-Propellant Rocket Motors," J. Humphries, B.Sc., G.I. Mech.E.

Feb. 14th.—The Institute of Transport: The Brancker Memorial Lecture "Off the Record: The Influence of Records on Air Transport," Major R. H. Mayo, O.B.E., M.Inst.T.

Feb. 14th.—R.Ae.S. (Derby) "Pictures in the Air," C. E. Brown, F.I.B.P., A.R.P.S.

Feb. 15th.—Londonderry House: Films: "Pacific Air Route," W. Courtenay, M. M.

Feb. 16th.—R.Ae.S. (Brough): "Jet Engines," W. T. Winter.

Feb. 16th.—R.Ae.S. (Preston): "The Propeller-Turbine Aero-Engine," F. H. Owner, M.Sc., F.R.Ae.S., M.S.A.E.

Feb. 16th.—R.Ae.S. (Gloucester and Cheltenham) "The Design of an Aeroplane," Prof. R. L. Lickley, B.Sc., D.I.C., F.R.Ae.S. At Cheltenham.

Feb. 16th.—R.Ae.S. (Hatfield) "The Probable Rôle and Influence of Aircraft in Future Warfare," Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.

Feb. 17th.—Royal Aeronautical Society: "Planned Servicing in the Royal Air Force," S/L. E. A. Harrop, O.B.E., A.F.R.Ae.S.

Feb. 17th.—R.Ae.S. (Coventry) "The London-Sydney Air Route," C. H. Jackson.

Feb. 18th.—Institute of Navigation: "Operational Aspects of Marine Radar." A Symposium of Papers. Chairman: Sir Robert Watson-Watt, C.B., F.R.S.

Feb. 22nd.—R.Ae.S. (Belfast): Lecturettes and Informal Discussion.

Feb. 24th.—R.Ae.S. (Manchester) "The Development of the Mamba Engine," A. S. Lindsey, M.A., A.F.R.Ae.S.

Feb. 24th.—Royal Aeronautical Society: "Flutter and Stability," Prof. W. J. Duncan, B.Sc., F.R.Ae.S., M.I.Mech.E., F.R.S.

Feb. 24th.—R.Ae.S. (Isle of Wight) "Naval Aircraft," Lt. Cdr. E. M. Brown, O.B.E., D.F.C., M.A., A.F.R.Ae.S.

Feb. 26th.—Society of Licensed Aircraft Engineers South Eastern Area Lecture. "Airframe Repairs," G. C. Banks, Manson House, 26, Portland Place, London, W.1., at 3 p.m.

Feb. 26th.—Helicopter Association of Gt. Britain: "Helicopter Transmission Systems," K. Watson, A.R.Ae.S.

Feb. 28th.—Institute of Public Administration: "The British Overseas Airways Corporation," J. O. Blair-Cunynghame.

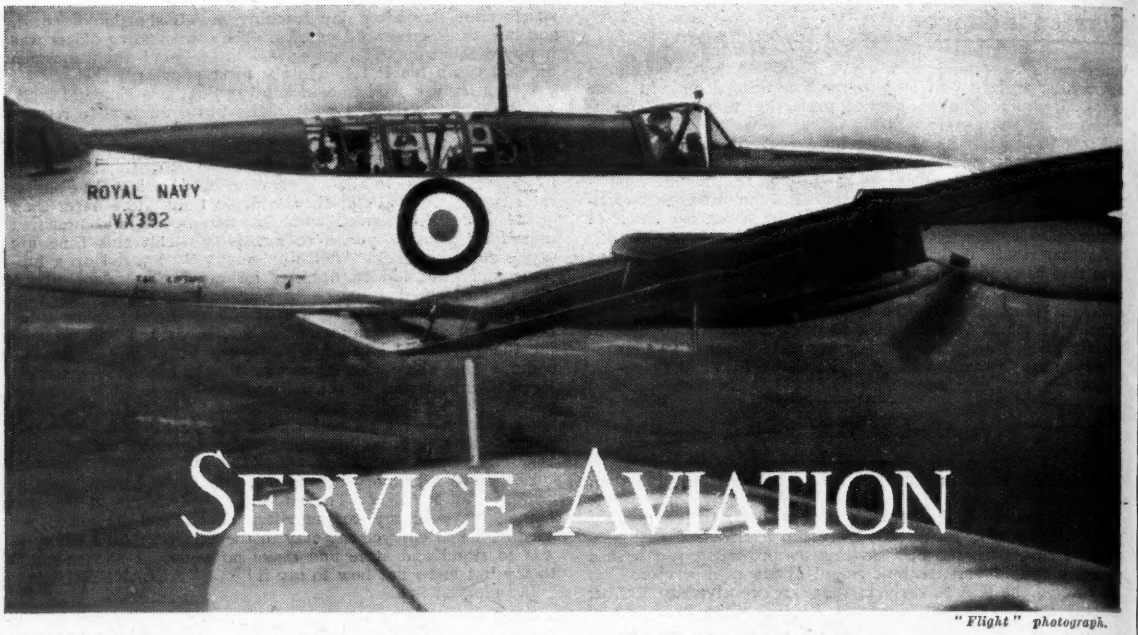
Mar. 2nd.—R.Ae.S. (Luton) "Evolution of a Modern Aeroplane," Prof. R. L. Lickley, B.Sc., D.I.C., F.R.Ae.S.

Mar. 2nd.—R.Ae.S. (Graduates' and Students' Section) "The Development of the Brabazon I," G. P. Hebden, A.F.R.Ae.S.

Mar. 3rd.—R.Ae.S. (Gloucester and Cheltenham) "Electrical Aircraft Instruments," E. B. Moss, B.Sc., F.Inst.P., M.I. Mech.E. At Gloucester.

Mar. 5th.—Rugby Football, Twickenham, Royal Navy *versus* The Army.

Mar. 5th.—Royal Aeronautical Society: Full day Discussion on Air Safety,



SERVICE AVIATION

"Flight" photograph.

FOCUS ON FLAPS: By cutting off the wing and tail extremities, this new study of a Fairey Firefly 5 centres attention on the four-position hydraulically-operated Youngman flaps (here set for "cruising"), which contribute so much to the Firefly's operational qualities.

Another Air Lift

ON a smaller scale than the Berlin air lift, but under equally urgent circumstances, the R.A.F. took the first steps, on February 4th, to relieve 80,000 Arabs threatened by famine in the Hadhramaut Valley in Southern Arabia, separated from the Red Sea by a 6,000ft escarpment. The Arabs, in the sultanates of Quaiti and Kathiri, are suffering from the failure both of their crops and the sardine harvest, which feeds their camels, now too weak to make the strenuous climb from the coast. There is no road from Aden, and airfields cannot be improvised in the area, so R.A.F. Dakotas are now being used, at the request of the Governor of the Aden Protectorate, to relieve the famine.

Carrying sacks of grain and containers of dates, which are dropped "free," the aircraft operate from Riyan, 325 miles east of Aden. Supplies are thrown from the Dakotas by R.A.S.C. dispatchers into dropping zones, marked with white circles, positioned by the local authorities. S/L. A. D. Frank, D.S.O., D.F.C., officer commanding the operation, expects to fly three sorties per day, each lasting nearly two hours, with each aircraft.

Jet Experience for Auxiliaries

PARTLY due to the unsuitability of airfields, the process of re-equipping auxiliary squadrons with jet fighters was not being completed as rapidly as might have been hoped, stated the Secretary of State for Air recently. Mr. Henderson was addressing a meeting of the City of London Territorial and Auxiliary Forces Association at the Mansion House, and during his speech welcomed the assistance now being given by T.A.F.A.s throughout the country to the present reserve recruiting drive.

Mr. Henderson said that as a result of special measures to be taken during 1949, it was hoped that an increasing number of auxiliary pilots would be able to gain jet flying experience, and familiarize themselves with the new types of aircraft now in service, even though it might not be possible to re-equip their squadrons completely at this stage. It should not be thought, however, that squadrons armed with Spitfires would be useless in an early emergency. For some time to come the Spitfire would still be an effective and formidable weapon.

Paying tribute to No. 600 (City of London) Squadron, the Secretary of State recalled that it was the top-scoring night fighter squadron, with 165 enemy aircraft to its credit at the end of the war. "I am glad to say that recruiting for this squadron is doing well," he continued, "We are within sight of its establishment, and now require only three officers for flying duties and 46 ground tradesmen."

Royal Air Force and Naval Aviation News and Announcements

Manchester Fly-past

SHORTAGE of volunteer maintenance ratings has been one of the main handicaps of the R.N.V.R.'s four air squadrons. At Stretton Naval Air Station (H.M.S. *Blackcap*), the base of No. 1831 Squadron, servicing of the squadron's Seafires has until recently been undertaken by regular serving ratings, but 30 of the 200 volunteers required have now come forward and it is hoped that many more former maintenance ratings will be enrolled during two local recruiting weeks—one now under way in Manchester, with another due to begin in Liverpool on Monday, February 26th.

This week's activities in Manchester will be rounded off by a fly-past over the city on Saturday, February 12th. Seafire 17s of 1831 Squadron will be supported by 16 Spitfires from the R.Aux.A.F., representing No. 613 (City of Manchester) Squadron, No. 610 (County of Chester) Squadron, and No. 611 (West Lancashire) Squadron.

Westland Development

IT may now be announced that the manufacturer's designation W.35 has been allotted to a new Westland experimental strike fighter, powered by a Rolls-Royce Clyde turboprop. Reference to the possibility of installing a turboprop in place of the Eagle piston engine fitted to the Westland Wyvern (W.34) has already been made in *Flight*. The maximum rating so far announced for the Clyde is 3,020 s.h.p., plus 1,225 lb static jet thrust.

Radar "Button Pushers"

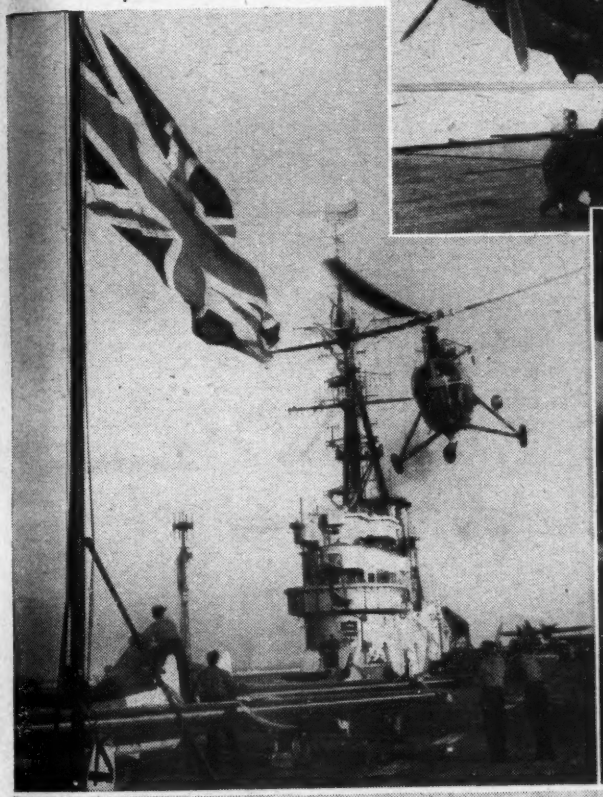
ADDRESSING members of the Radar Association at their reunion dinner on January 28th, Sir Robert Watson-Watt, the radar pioneer, said that an efficient early warning system, effective interception, and an elastic counter measure system depended not on the buttons to be pushed, but on the expert knowledge and training of the button pushers.

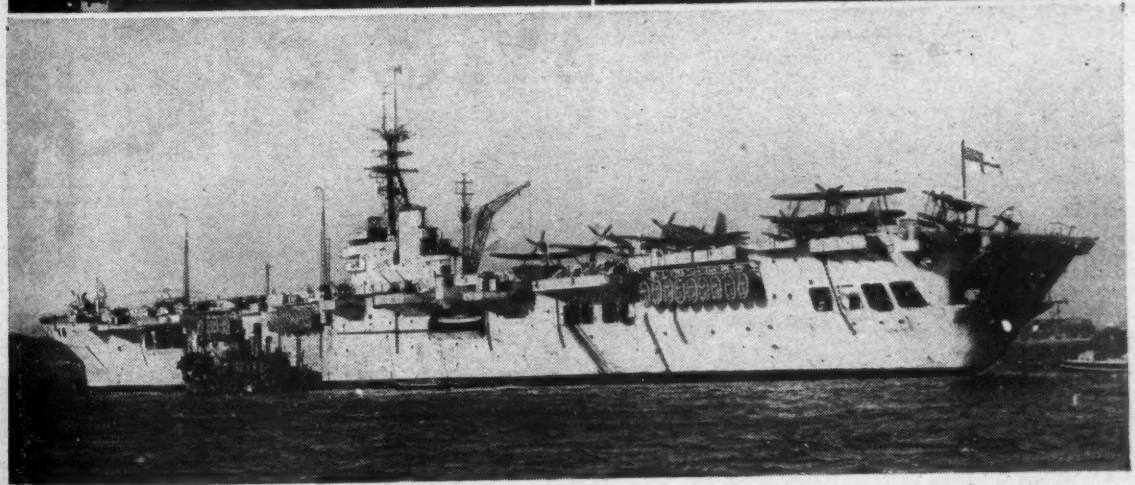
"This group of foundation members of the now ancient order of radar button pushers," he said, "has a great moral responsibility for the continuing and developing efficiency of the radio and radar elements that are vital to our defences. They are the natural core of

(*Continued on p. 182*)

Chilly Mission

Special Naval Force Investigating Problems of Arctic Operations





THE 14,000-ton light fleet carrier **Vengeance** *in Portland Harbour, before leading the experimental Naval force into Arctic waters for a six-weeks cruise, during which the effects of low temperatures on ships and crews will be closely studied. Some of the aircraft to be operated can be seen on the flight deck, including the Firefly,* **Westland-Sikorsky S-51,** *Sea Fury, Firebrand, and Sea Otters. Shown above are three scenes aboard H.M.S.* **Vengeance** *during last week's preparations for the Arctic trials. In the foreground (left) are two of the latest Mark 20 Sea Vampires. The hovering* **Westland-Sikorsky S-51** *helicopter, fitted with a small power-operated crane, is available for air-sea rescue, as is the* **Barracuda 3** *(right) with an airborne lifeboat. The Anarak, immersion, and destroyer foul-weather suits at lower right will be tested for the first time under Arctic conditions. Some details of the cruise appear overleaf.*

Service Aviation . . . . .

the Fighter Control Units, of the radar trades in the R.A.F.V.R., and should very closely examine their consciences about the nation's need for their joining now these units."

Auxiliaries Exercise

METEORS of No. 500 (County of Kent) Squadron, and Spitfires from No. 615 (County of Surrey) Squadron took part in an exercise in the Hythe-Folkestone area on Sunday, January 30th. The purpose of the exercise was to demonstrate air close-support methods to about 100 officers of the 44th (Home Counties) Territorial Infantry Division. Both types of fighter were called down from the "cab-rank" by a mobile wireless van, representing an armoured reconnaissance vehicle, containing an R.A.F. ground control officer, to attack a target on the Hythe golf course. Four Meteors then landed at their home airfield, West Malling, for refuelling, and took off again to make an attack on the "Surrey" Spitfires. The Territorial officers were later flown over the target area in Ansons, and were also shown an exhibition of airborne supply equipment.

W.R.A.F. Inaugurated

THE birth of the new Women's Royal Air Force was officially recognized by a ceremony in the Air Council Chamber on January 31st, when Mr. Arthur Henderson, the Secretary of State for Air, handed to Air Commandant F. H. Hanbury, the director of the W.R.A.F., a document setting out the terms of service of the Force. Marshal of the Royal Air Force Lord Tedder, Chief of Air Staff, was also present at the ceremony.

W.R.A.F. INAUGURATED: Air Commandant Felicity Hanbury, Mr. Arthur Henderson, and Lord Tedder, at the recent ceremony referred to on this page.

R.A.F. Permanent Commissions

GENERAL DUTIES BRANCH.

Squadron Leader: D. N. Fearon.

Flight Lieutenants: F. J. Belfitt, D.F.M., E. W. Forwell, D.F.C., H. G. Garawood, D. B. Halcro, D.F.C., H. E. Hopper, F. W. Hubbard, D. A. C. Hunt, J. J. W. Lewis, D.F.M., W. Massey, W. R. Owen, D.F.C., R. J. H. Pearson, R. J. B. Roach, J. W. S. Sinclair, D.F.C., H. M. J. Smith, G. F. Thornton, D.F.C., L. E. Thorogood.

Flying Officers: J. W. Carter, D.F.M., J. R. Maitland, K. J. Tabor

TECHNICAL BRANCH.

Squadron Leaders: W. E. Bloomfield, G. C. Hibberd.

Flight Lieutenants: C. J. Hayne, D. W. Hutchinson, J. L. Le Crerar, T. McNicholas, D.F.C., D. L. Ross, E. H. Sowden, A. W. B. Stewart.

EQUIPMENT BRANCH.

Flight Lieutenants: A. F. Betts, C. F. Fairfoot.

Flying Officers: T. F. Burd,, F. J. Dingle, B. W. L. Hidden, G. G. Murray, C. W. Turner.

SECRETARIAL BRANCH.

Squadron Leaders: J. M. Littler, H. M. Sanderson, S. Shield, J. R. Skelton, H. A. O. Wootton.

Flight Lieutenants: T. Allen, W. H. Hasselstrom, J. G. Pearse.

Flying Officers: F. R. King, W. F. Stuart.

R.A.F. REGIMENT.

Flying Officer: B. S. G. Button.

AIRCRAFT CONTROL BRANCH.

Flight Lieutenants: A. De L. Greig, D.F.C., K. G. Marks, A. E. C. Oakshott, A.F.C., E. M. Robinson.

CHAPLAINS' BRANCH.

Reverend: T. Ryder (C. of E.).

PROVOST BRANCH.

Squadron Leader: J. M. Gillen.

CATERING BRANCH.

Flying Officer: T. W. Hood.

PHYSICAL FITNESS BRANCH.

Flying Officer: J. A. M. Davies.

Reunion

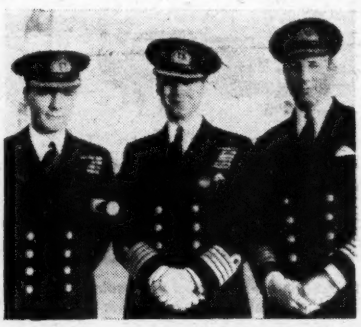
THE reunion for No. 78 Squadron will be held in London on Saturday, April 2nd. Details from J. D. Lane, 4, St. Mary Abbot's Court, Kensington, W.14.

CHILLY MISSION

TWO destroyers and an aircraft carrier were due to sail from Portland on Saturday, February 5th, for an area several hundred miles north-east of Iceland. The purpose of their cruise, which will last some six weeks, is the testing of Naval equipment, and observation of personnel under Arctic conditions. Ships participating are the 14,000-ton light fleet carrier H.M.S. *Vengeance* and the Battle class destroyers H.M.S. *Gabbard* and *St. Kitts*. They will be joined for some time in the trials area by a frigate, submarine and fleet oiler. The area has been selected as that most likely to combine sufficiently low temperatures with reasonable flying conditions.

A great deal of Arctic experience was, of course, obtained by the Navy during the war, but no systematic records were kept of the performance of men, ships, and aircraft. It was, therefore, decided to send this force to try out and record the behaviour of the Navy's latest equipment.

H.M.S. *Vengeance*, the subject of the illustrations on p. 181, is the main unit of the Arctic force. A representative selection of modern Naval aircraft is carried, consisting of Sea Vampires, Sea Furies, Fireflies, Firebrands, and Sea Otters. As operations will take place far from land bases, a specially equipped Westland Sikorsky S-51 helicopter, and a lifeboat-carrying Barracuda have been provided for air-sea rescue duties. Checks will be made on the time taken to range aircraft on the flight deck and to warm up engines. Snow and ice on the flight deck, and the performance of radar and communications equipment will be among the numerous subjects requiring study by the specialist officers from various Admiralty departments, accompanied by civilian scientists, who will be on board the ships.



Officers of H.M.S. Vengeance shown here are (L. to R.) Cdr. L. W. Binnington, D.S.O., D.S.C., Capt. J. Terry, K.B.E., M.V.O., and Capt. H. P. Sears.

The impeding effect of temperatures as low as 22 deg F on aircrews, mechanics, and deck handling parties will be measured, and experimental clothing, designed to counter the cold conditions, has been issued. Among the protective wear are the two-piece Anarak suits, consisting of a hooded smock and trousers in woven wind-proof cloth, lined with blanket material, as worn by members of the Falkland Islands survey team (some of whose activities are illustrated on p.163 of this issue); rubberized felt boots; and plastic-impregnated foul-weather coats, which are designed to replace oilskin coats.

For the duration of the cruise, rations equivalent to 4,300 calories per day will be issued—an increase of about 30 per cent on the average civilian diet in this country. As a test of sufficiency for this diet the N.A.A.F.I. have been asked to keep a check on the rate of consumption in ships' canteens during the cruise, and for a similar period after personnel have reverted to normal rations. Doctors and psychologists will observe the effects of the voyage on the health and morale of the crews.